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AMERICAN INDUSTRIES.—No. 87.

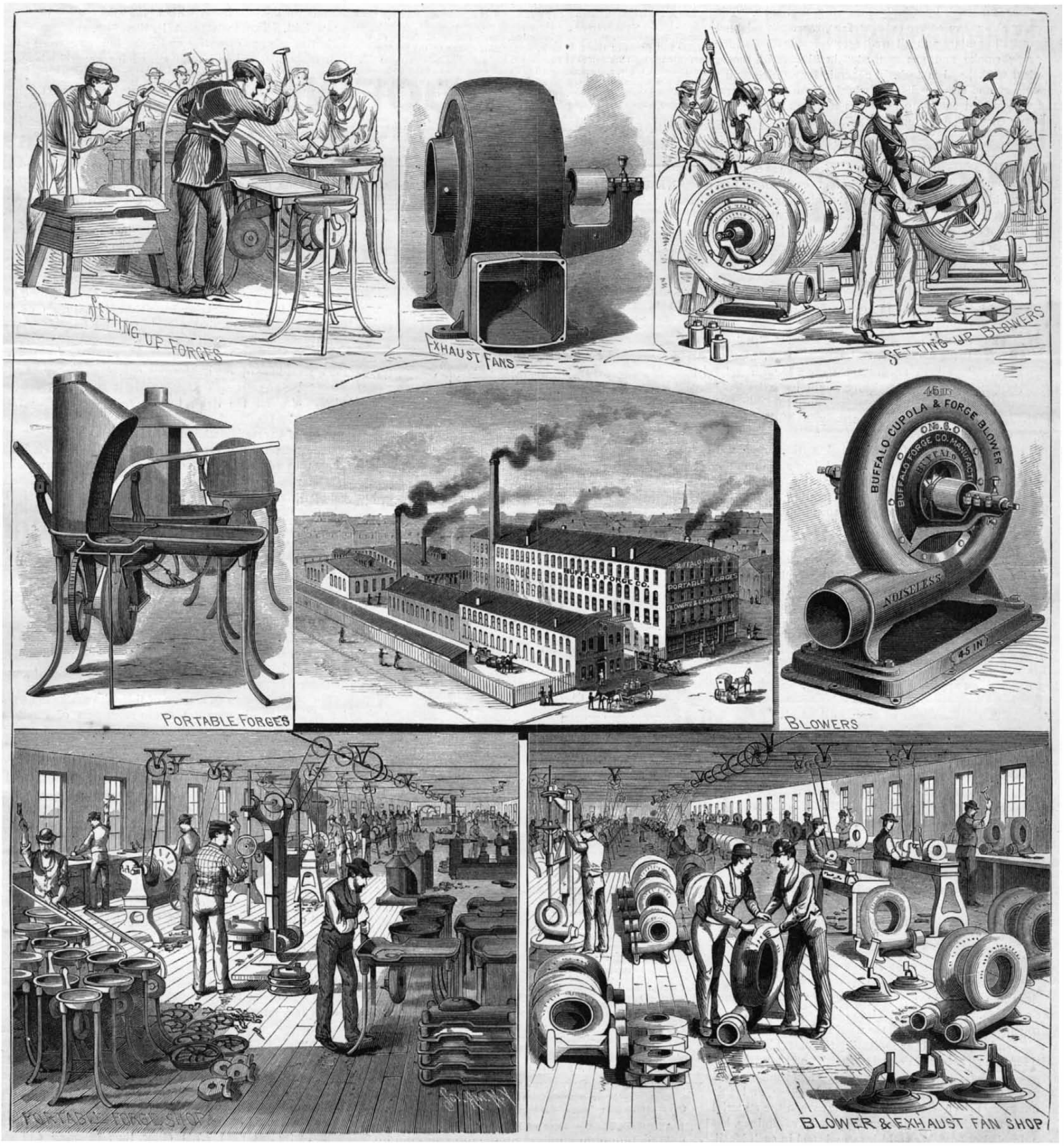
THE MANUFACTURE OF PORTABLE FORGES AND BLOWERS.

About five years ago, in January, 1878, the industry illustrated herewith had its foundation in a small shop occupying but a single room and employing only two men, making one style of portable forge and nothing more. The fact that the Buffalo Forge Company, from this small beginning, and in so short a space of time, has acquired extensive buildings and now employs a force of 120 men is ample evidence of the enterprise of the company and of the merit of its manufactures. As shown in the engraving, the works comprise a machine shop, foundry, warehouse, and outlying sheds. Even with these commodious buildings the quarters are found too small, and large additions are contemplated.

Starting with the intention of making nothing but the first quality of work, the business of the company has naturally and steadily grown, and now seventeen different styles of portable forges and hand blowers are made, which are suitable for all purposes, from the most delicate uses of jewelers and dentists to the heaviest kinds of smith's work. A complete line of power blowers and exhaust fans for every possible duty is made by this company. In addition to the various kinds of blowers, these works turn out the Buffalo cabinetmaker's clamp, the Buffalo wagon jack, and a complete line of pulleys and hangers.

The Buffalo forge has outstripped its predecessors, and may now be found as a staple article of stock in every large hardware and iron house in the country. The steamers leaving New York carry export orders of these articles to South America, the West Indies, England, Australia, the Netherlands, and in fact to every principal distributing point in the world.

We are told of a tourist lately returned from a tour in the Eastern hemisphere, who says that in all his wanderings the Buffalo forge could be seen, and it served as a continual reminder of home. In the great West, where new railroads are constantly being built, the surveyor with his theodolite is followed by the navvy with his Buffalo forge, and in all the



WORKS OF THE BUFFALO FORGE COMPANY, BUFFALO, N. Y.

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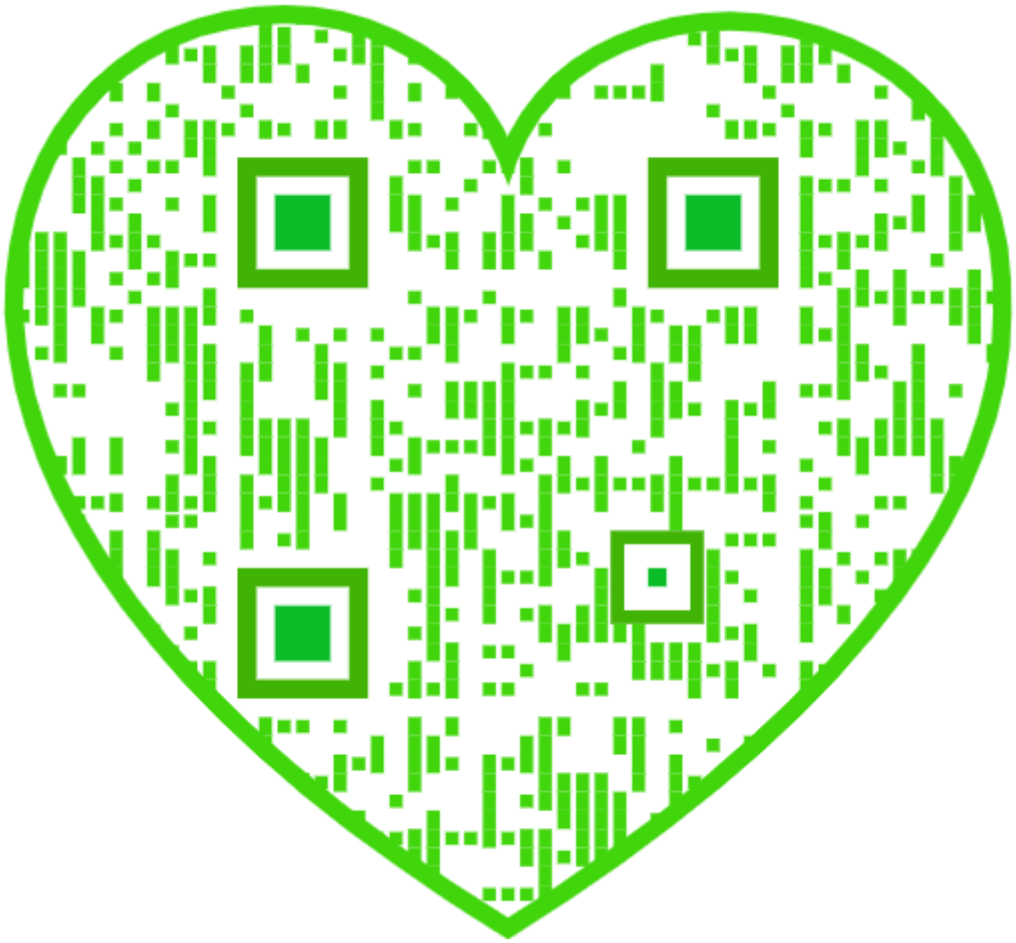

shops, great and small, in the mills and factories, the forge is an essential element.

The portable forges made by this company are so well known everywhere that it seems almost superfluous to enter into any detailed description of them. Before the issue of the patents under which these forges are made, all portable forges in the United States were operated, by means of the laborious crank motion, which necessarily confines the operator close to the fire. The chief improvement consists in operating the blower by means of a lever and ratchet, the lever having the swivel motion so natural to the blacksmith. This improvement was recognized immediately, and was one of the novel features that distinguished this style of forge and insured its great success.

The original and novel power blower made by this company for cupolas, forge fires, etc., is deserving of special notice. All blowers previously made had the shell or case made in halves, necessitating the bolting of the parts together around the entire circumference of the blower, resulting in a cumbrous, ill shaped machine at an unnecessary expense. The Buffalo blowers have a shell cast in one solid piece, combining the elements of beauty, strength, and economy, and this, with the improved journal bearings, makes this machine not only low in price, but better in quality than others of the same class.

The shavings exhaust fan for planing mills, furniture and piano factories, and all uses requiring a partial vacuum has a peculiar mouthpiece, by means of which the material to be conveyed may be carried to the right or left, or in both directions if desired, by simply loosening four bolts. The company also manufacture exhaust fans, especially adapted for ventilating mines and all underground apartments; for removing smoke and gas generated in blacksmith shops, chemical works, and factories in general; for removing dust from emery and other polishing wheels, buffing machines, sand wheels, and tumbling machines used in cleaning and polishing castings; for removing offensive odors from try kettles, dyeing works, varnish factories; and for use in packing houses and refrigerating cars, etc.

They also manufacture all the accessories, such as countershafts and pulleys, blast gates, etc.; in fact, everything pertaining to this line of business, from the miniature forge for miners, jewelers, dentists, locksmiths, farmers, and tinsmiths to the mammoth blowers and exhaust fans for the largest uses

The works in which all this variety of manufacture is carried on occupy Nos. 480 to 490 Broadway, and 166 to 182 Mortimer Street, Buffalo, N. Y.

The buildings are shown in the central view of our engraving, and interior views and representations of some of the products are shown in the marginal views.

The first floor of machine shop is 50 x 135 feet, fitted up with special tools for the speedy and economical execution of the work. Prominent among these are a large, special pulley lathe and special pulley borer, built by Niles Tool Works, of Hamilton, O., and kept running to their full capacity. This floor is almost exclusively devoted to fitting up forges and hand blowers.

The second floor is used for fitting and setting up power blowers and exhausters, and on the third floor are found the wood workers, tinsmiths, and painters; on the fourth floor, pattern making department, and experimenting rooms.

The building adjoining is used on the ground floor for blacksmith shop and tumbling rooms, and on upper floor as warehouse and shipping department.

The foundry, situated back of the machine shop and warehouse, is a commodious structure 60 x 100 feet, with two wings, each 30 x 40 feet. It has every facility for first class work, and is fitted up with a view to the comfort of employes.

We are informed that the company has now in hands of the printer a new and complete forty-page catalogue of specialties, making a hand book indispensable to every mechanic and farmer who wishes to keep up with the times, and which they will mail on application to any address.

The Corrosion of Iron and Steel.

M. Gruner recently communicated to the Academie des Sciences some observations on the relative perishability, under certain circumstances, of cast iron, steel, and soft malleable iron. Plates of different composition were immersed during equal periods in water acidulated with 0·5 per cent of sulphuric acid, and also in sea water, and exposed in moist air. It was found that in moist air chromate steels were most rapidly corroded, and tungsten steels less than carbon steel. In similar conditions cast iron oxidized less than steel and soft iron; and white specular iron rusted less than gray cast iron. Thus hard white cast iron is the best for withstanding damp air—an observation which agrees with common experience. Sea water, on the other hand, attacks cast iron more than steel, and especially the white specular kind. Tempered steel stands in sea water better than the same steel annealed; and soft steel is less attacked than manganese or chromate steel. Acidulated water acts upon gray cast iron like sea water, strongly affecting the more impure gray cast iron. White specular iron is not so much affected. These experiments agree with the results obtained by Mallet in 1843, and are valuable as indicating the best kind of material for iron structures in certain localities and for different purposes. The atmosphere of Manchester and similar places is known to have a very powerful acid reaction, and this circumstance may be taken into account when the material for lofty exposed structures, such as gas holder framings, has to be decided upon. Wrought iron and steel in such localities are thus seen to be exceptionally liable to decay.

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SIX HUNDRED AND FIFTY MILES BY TELEPHONE.

In our last issue we gave an account of recent successful experiments in telephoning over the new wire of the Postal Telegraph Company, between this city and Cleveland, Ohio, a distance of six hundred and fifty miles.

We have now to report the results of further experiments over the same line, made by ourselves on the invitation of the officers of the company. On the 13th inst. we visited the Postal Telegraph Company's headquarters in this city—the large and splendid building No. 49 Broadway. Here we were received by Mr. F. W. Cushing, the able and obliging Manager of the company, who at once placed at our disposal, for the purposes of the experiment, the use of the line wire to Cleveland, with the necessary instruments for transmitting and receiving conversation.

The new wire, as our readers will remember, is composed of steel and copper, its chief peculiarity and merit being its extraordinary conductivity. So great is the facility of the new wire for carrying the electrical current, that sounds and signals may be sent through it for lengths of a hundred miles as easily as through a common wire of ten miles; the new wire thus annihilates space, brings far distant places near together, and realizes the long sought desideratum of easy telegraphic and telephonic communication.

The instrument used by us in this experiment was a Hopkins transmitter, worked by two cells of the Leclanché battery. The principal novelty of this transmitter consists in a carbon electrode that floats on mercury, and the buoyancy of the carbon presses it into contact with the diaphragm of the telephone, without the intervention of spring or weight. The instrument is, therefore, constantly self-adjusting, always operative under the loudest as well as the softest sounds, and admirably suited for general telephonic purposes.

The wire is poled with forty or forty-five poles to the mile, and insulated in the ordinary manner throughout the line, except at the Hudson River, under which it passes in a cable 4,980 feet in length; and by a short cable under the river at Cleveland.

The transmitter was hung upon the wall like the ordinary instruments, and we gave the usual call, "Hullo! Hullo!" to Cleveland. We were instantly answered in clear tones by Mr. C. H. Rudd, the superintendent of the Postal Company in Cleveland. With him we then maintained a telephonic conversation for a considerable time; several other gentlemen in the party did the same, among whom was Mr. G. M. Hopkins, the inventor of the transmitting instrument. Finally, to make the test as thorough as we could, we asked Mr. Rudd to read something from the editorial page of the Cleveland *Herald* of that morning, which he proceeded to do, his reading being written down by us at this end of the line. He read several items. A day or two following, on the arrival here of the mail from Cleveland of March 13, we obtained a copy of the *Herald* and found therein, *verbatim et literatim*, all the items that were read to us by Mr. Rudd.

Those of our readers who have had any considerable experience in telephoning, especially in the city of New York, know that this was a satisfactory test of the Cleveland wire. If the reading of random newspaper items can be intelligently done, then anything may be sent. We have only to add that the noise from induction was about the same as on our city lines, and we were able to speak to Cleveland and hear the answers with greater ease and satisfaction than we often experience in trying to talk from our office to points in town that are only two or three miles apart.

For the accomplishment of this remarkable result, the opening of telephonic communication for distances of six hundred and fifty miles, the public is indebted to the enterprise of the stockholders and directors of the Postal Telegraph Co. and the corps of able manufacturers, inventors, and electricians whom the company has been so fortunate as to associate with them.

The construction and success of this wire marks the opening of a new and important era in the march of electrical progress. Its benefits and influence will indeed be far reaching. It opens the prospect of a more extensive, better, and cheaper system of electrical communication than has ever been employed, or hardly dreamed of as possible. One wire will have the business capacity of many common wires; one improved wire will, in fact, enable us to do things that could by no possibility be accomplished by the ordinary wires

The Postal Telegraph Company's compound wire has a diameter of $\frac{7}{8}$ of an inch, consists of a steel wire core, weighing 200 pounds per mile, that will resist a tensile strain of 1,650 pounds, on which copper is deposited to the extent of 500 pounds per mile, with a resistance to the electric current not exceeding 1·7 ohms. The wire has seven times greater conductivity than iron wire of equal size, copper being the best conductor known except silver. It has double the tensile strength of iron wire of equal weight when strung on the lines, will last longer, permits the use of low tension currents and small batteries.

Ninety per cent of the wires now in use are No. 9 iron, with a resistance of 20 ohms per mile, and the very best are No. 6 iron, with a resistance of 10 ohms, while the compound wire to be used by this company has a resistance of only 1·7 ohms. The resistance of No. 9 iron wire on a line from New York to Chicago, 1,000 miles, is over 20,000 ohms, and on a No. 6 iron wire over 10,000 ohms, and on the compound wire less than 1,700 ohms, thus bringing Chicago telegraphically as near to New York as Philadelphia, and San

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Francisco as near as Cleveland, compared with the best wires now in use.

The company is now finishing the line from Cleveland to Chicago, and in a few days we shall probably be able to chronicle the wonderful fact that telephonic communication between New York and Chicago—distance about 1,000 miles—is established.

This remarkable conductor is made by Wallace & Sons, of Ansonia, Conn. The process of manufacture is peculiar. The steel wire, arranged in the form of spirals, is slowly screwed forward through the electro-plating batteries, by which the copper, to the above thickness, is deposited on the wire. We understand that no less than twenty large electrical dynamo-machines are employed to effect the deposition of the metal.

We believe that Professor Moses G. Farmer was the original inventor of the compound steel and copper wire. This was in 1869. Its introduction has been retarded for lack of proper means for its successful manufacture. The copper was originally proposed to be wound around the steel in the form of a ribbon; afterwards the attempt was made to draw the copper upon the steel by rolling; but neither of these methods proved satisfactory. The plan adopted by Messrs. Wallace has been crowned with success, enabling them to cover the wire with copper to any desired thickness, while it is so tenacious that the wire may be tied into a close knot without disturbing the copper.

EARLY STEAM ENGINES AND BOILERS.

In a recent paper read by Mr. John Whitelaw before the Civil Engineers' Club, of Cleveland, O., he gave some interesting information about the performances of steam engines as made about a hundred years ago.

In this country the duty of a pumping engine is estimated by the number of pounds of water raised one foot high on a consumption of one hundred pounds of coal. Thus the record of the pumping engines at Lynn, Mass., is stated to be in round numbers 104,000,000 pounds of water raised one foot high for each 100 pounds of coal burned.

These results show remarkable gains over the old-time engines. In 1770 Jonathan Hornblower and John Nancarrow were the most noted builders of pumping engines. The best average duty which they were able to get from 100 pounds of coal was, in round numbers, 6,000,000 foot pounds; so the Lynn engine does more than sixteen times as much work for the same fuel as the old style of machines. These were vacuum engines. Steam was only used to make a vacuum, and thus generating power. James Watt's improvements followed, and in 1793 he had so far improved the steam engine that his best machine made an average duty of 27,000,000 foot pounds per 100 pounds of coal. The Lynn engine does about four times better than that. Watt at this time pronounced his engine perfect, and said that no further improvement could be expected.

In 1814 Arthur Woolf made engines that showed a duty of thirty-four millions of foot pounds; and in one example a duty of seventy millions was reported.

In 1828 Capt. Grose made improvements on his engine, and the duty was found to be a little over eighty-seven millions.

In 1834 William West produced an engine that yielded a duty of close on to ninety-nine millions of pounds.

In 1840 Hocking and Loam extended the expansion principle, and in 1842 one of their engines showed a duty of one hundred and seven millions of pounds—a result that is hard to beat at the present time.

The boiler engineering and firing of the old time was very peculiar. Instead of increasing the number of boilers when more steam was required, they used to have one boiler of gigantic dimensions, with correspondingly enlarged fireplace. They also placed the fire bars eight or ten feet below the bottom of the boiler, and then filled up the space with coal. They thought the more coal they burned the more steam they would get. A boiler at Dalcoath mine was 24 feet in diameter and 24 feet high. The furnace was 7 feet below the bottom of the boiler, was 9 feet wide, and extended from one side of the boiler to the other. Trevithick said the fire in this boiler was 7 feet thick, and had in it 30 tons of burning coal.

Engineers have learned a thing or two about steam and boilers during the past hundred years; but there is doubtless a vast amount of knowledge on the subject yet to be acquired.

THE LEFFEL TURBINE.

We lately had the pleasure of inspecting a magnificent specimen of this motor, recently constructed by James Leffel & Company, of Springfield, Ohio, to order of the Smithsonian Institution, Washington, D. C. The wheel in question is very strong, having been built for a high head of water; its mechanical execution is perfect, and its finish resplendent. All the parts are highly polished, and heavily plated with gold and silver. This wheel is intended for the permanent museum of the institution, and was selected as the representative of standard excellence among American made water wheels—a fact which is of course highly gratifying to the manufacturers, as well as thousands of manufacturers who use this effective and reliable machine. The Leffel is a double action wheel, being in fact two wheels combined on one shaft; is fitted with adjustable gates, and contains the latest improvements.

SANITARY PRECAUTIONS AFTER FLOODS.

The following instructions emanate from the *Comité Consultatif d'Hygiène Publique*, dated June 12, 1856, and from the *Conseil d'Hygiène Publique, etc., de Salubrité du Departement de la Seine*, dated January 5, 1883, both of France. They are of peculiar interest to us at the present time on account of the Western floods.

Sanitation of Houses.—Habitations which have been invaded by the waters should receive special care, so that those whom the flood has expelled should not occupy them before they have been made sufficiently healthy for habitation.

They should first be cleaned out as quickly and thoroughly as possible, and freed from all dirt and *débris* deposited in their different parts by the water.

Continuous aeration and the most active ventilation are the best and most energetic agents of sanitation for houses.

To increase these as much as possible, where it can be done, a large fire should be maintained on the hearth, and the doors and windows opened, so that the light and heat of the sun may contribute their part to purifying the air.

At the same time care must be taken to dig a ditch 10 to 15 inches deep around each house, whose interior is in many cases below the level of the ground, which proceeding realizes one of the simplest and most active sewage systems.

It will also be well, after having torn down all plastering, which will be in a bad condition, to scrape to their bottom all joints in the walls, and to replaster them in the parts of the house most injured, and where bad deposits have principally accumulated. The floors, where such exist, should be carefully attended to, and the soil under them covered with a disinfecting substance, such as pounded charcoal, or sand, or else with an impermeable material, such as flagging, paving blocks, cement, etc. Where the house is several stories high, the top stories should be the first occupied.

Great precautions should also be followed in the treatment of certain articles of furniture, such as beds and mattresses, which must be renovated or replaced, and which should never on any account be used until thoroughly dried.

Sanitary treatment, such as adopted for houses, should be applied with no less vigilance to stables and barns to prevent epizootics, whose deplorable consequences there is no need to allude to here.

One peculiar feature it is important to note, though it can only be accidentally produced: it is the possible alteration of the water of wells and springs of potable water, in whose neighborhood matter in a state of decomposition may have been deposited, or piles of excrementitious and organic *débris*, or which sources of water supply may have been contaminated by the contents of privy vaults. Attention should be directed to this danger.

To disinfect cellars into which, by agency of the inundations, the contents of privy vaults may have penetrated, commercial sulphate of zinc may be used, either by sprinkling it in powder in the cellar, or by watering the ground when the water has gone down with a concentrated solution of this salt.

For the same purpose the solution of chloride of zinc, a disinfectant known as "St. Luke's Water," may be employed. It is in daily use in the civil hospitals.

The concentrated solution of sulphate of iron does well, but the disinfection is not so complete as with salts of zinc; it is, however, cheaper.

The last consideration is of little importance, because two kilogrammes (nearly five pounds) of zinc salt, costing less than one franc, are enough. T. S.

Rarefied Air as a Conductor of Electricity.

Edlund continues his researches upon this subject. A number of experiments are described to show that the phenomena of the opposition to the passage of sparks from terminal to terminal in rarefied air cannot be explained by the theory that a vacuum does not conduct electricity. He carefully discusses the question of the contrary electro motive force which is developed at the terminals. "It is not the resistance of the gas but this electro-motive force, increasing with the rarefaction and connected with the electrodes, that presents an obstacle to the passage of the current. Everything is in favor of the hypothesis that vacuum opposes a very feeble resistance to the propagation of electricity." Without the employment of electrodes, one can excite an induction current in a Geissler tube, which is sufficient to produce light. This would be impossible if the highly rarefied gas or vacuum were an insulator. *Phil. Mag.*

Simple Cure for Cold Feet.

The following remedy for cold feet is recommended by the *Fireman's Journal* for sedentary sufferers, as well as policemen, car drivers, and others who are exposed to the cold: All that is necessary is to stand erect and very gradually to lift one's self up upon the tips of the toes, so as to put all the tendons of the foot at full strain. This is not to hop or jump up and down, but simply to rise—the slower the better—upon tiptoe, and to remain standing on the point of the toes as long as possible, then gradually coming to the natural position. Repeat this several times, and, by the amount of work the tips of the toes are made to do in sustaining the body's weight, a sufficient and lively circulation is set up. A heavy pair of woolen stockings drawn over thin cotton ones is also a recommendation for keeping the feet warm, and at the same time preventing their becoming tender and sore.

Solid and Hollow Iron Columns.

A confusion of ideas is sometimes found among practical men respecting the comparative strength of solid and hollow pillars. One hears it often said, for instance, says the *Building News*, that a hollow pillar is stronger than a solid one. Now this is, as one able authority has pointed out, not absolutely the case; it is perfectly true, that, comparing the strengths of two pillars of the same height and diameter, one solid and the other hollow, the latter has the advantage of being economically stronger. The fact is, the solid column is stronger than the hollow of the same external diameter; but the lesser area is more effective than the greater, because the central portions of the solid pillar are less useful in resisting the bending force than the metal in the circumference of the hollow pillar. But if the quantity of material in both the solid and hollow pillar of equal height is the same, the hollow pillar is by far the stronger. A simple geometrical construction will enable any one to understand this fact, by enabling us to proportion a hollow column of the same area as that of a solid one, by one of the diameters being given.

It is shown, in fact, that hollow columns of the same area of metal as a solid one may be made to any larger diameter, their strengths increasing proportionately till a limit is reached by the shell of the metal becoming too thin to insure a sound casting. Taking an example from Downing's work, a hollow pillar 9 inches in external diameter, having an internal diameter of 8·062 inches, and a thickness of metal of 0·47 inch, or about ½ inch, is 5½ times stronger than a solid pillar with the same quantity of metal. A thickness of ½ inch may be regarded as a practical limit in manufacture.

The Material for Good Superintendents.

The *Northwestern Lumberman* mentions a conversation had with a gentleman largely interested in the lumber trade at the West, when he said that there are grand chances for young men, of the right stamp, to find employment in the lumber business. The gentleman further remarked that it was almost impossible for him to find the right kind of men to superintend the different branches of his business. They must have a quick and sound judgment, and know the business from the stump up. He advertised for men, and out of seventy applicants there were but two that he dared to give a trial. There are plenty of men who are willing to step in as managers, but they want to begin at the top. If anything goes wrong under them, they are ignorant as to the way to correct it. The boys who began work moneyless and friendless have succeeded best. They began at the bottom round of the ladder, did not know more than their superiors, were willing to work and learn, were temperate, and now some of them are filling positions of trust and profit, while others are doing a good business for themselves.

It is not in the lumber trade alone where the boy commencing on the bottom round of the ladder has made his way upward and been crowned with success. But it is a fact, patent to all observers, that the successful men in all branches of business are generally those that commenced on the bottom round, and by their own unaided exertions worked their way upward, some to the top of the ladder, others to various heights; but most all who possess those qualifications our contemporary suggests as requisite for a manager in the lumber business to have, are sure of a fair degree of success at almost any business they may undertake.

Bleaching by Electricity.

Dr. Dobbie and Mr. J. Hutcheson, of Glasgow, in the course of certain experiments on the action of electric currents upon a solution of common salt, found that there is a formation of hypochlorite of soda—*i. e.*, bleaching soda. If the solution is neutral, there is an escape of chlorine during the action of the electric current, while a certain quantity of hypochlorite remains in the liquid If the solution is kept alkaline, all the salt is converted into hypochlorite. If it is made acid, all the chlorine escapes, and no hypochlorite remains in the solution. Experiments on the subject are now in progress in a Scottish bleach works on a large scale. The yarn or cloth to be bleached is saturated with brine, and passed between two rollers, each of which is in connection with one of the poles of a galvanic battery. The current passes through the moist goods and produces hypochlorite of soda (bleaching soda), or free chlorine, according as the solution of salt was alkaline or acid.

In the former case the goods must be taken through sours to complete the bleaching; in the latter case this is not necessary. Discharge styles upon cotton goods can be produced with rollers, which are partly covered with non-conducting materials. The current then passes only through the parts left uncovered. An advantage of the new process for bleaching is that in many cases it will supersede the previous bowking and washing, as the electric current has a decomposing action upon the resinous impurities.

A Medal of Honor.

The Pratt & Whitney Company Hartford, Conn., have just been awarded by the city of Philadelphia, on recommendation of the Franklin Institute, the John Scott Legacy Medal: "To the most deserving." The engraved award on the medal reads: "To the Pratt & Whitney Co., Hartford, Conn., for their standard gauges, taps, and dies; on the recommendation of the Franklin Institute." The medal is of bronze, four inches diameter, and is a fine specimen of the die-maker's art.

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IMPROVED RAILWAY ELEVATOR.

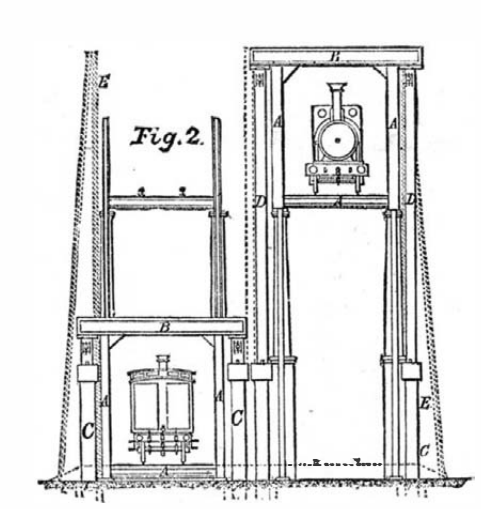
We illustrate in the annexed engravings a method designed by Messrs. Clark & Standfield, Westminster, of meeting one of the difficulties in connection with high and low level traffic on many of our existing and proposed railways.

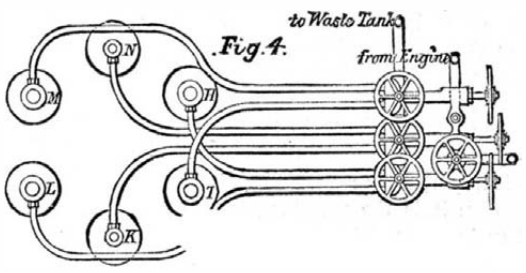
By means of these arrangements trains may be quickly and economically transferred from one level to another. The lift consists principally of a strong wrought iron rectangular frame, A, of sufficient breadth and height to admit all classes of ordinary rolling stock, the length being of course somewhat greater than that of the train to be lifted. The sides of the wrought iron frame are formed of open lattice girders, of such a depth that the transverse beams, B, may be clear of the top of the train. On each side of the wrought iron frame a series of hydraulic presses, C, is placed at suitable intervals. They are so arranged that the lifting power of the rams, D, is applied to the projecting ends of the transverse beams, B, so that the weight of the train is supported at points considerably above its center of gravity. By this arrangement a great deal of excavation for the presses is avoided and their upper ends are always easily accessible. At one or more points in the length of the lift there is provided a powerful wrought iron or other guiding frame, as at E, which serves to keep the lift always truly in a line with the rails on the approaches. The entire system of presses for each lift is arranged in a series of groups in such a manner that the failure of any group or single press would not endanger the stability nor delay the working of the lift, or there may be a separate ram and press in the accumulator for each one in the lift; both these arrangements insure the perfectly synchronous working of the rams. A certain number of rams also on each side of the lift are provided with safety valves arranged in such a manner that the slightest difference in level, either longitudinal or transverse, is immediately rectified automatically by the action of the valves at the higher end or side of the lift.

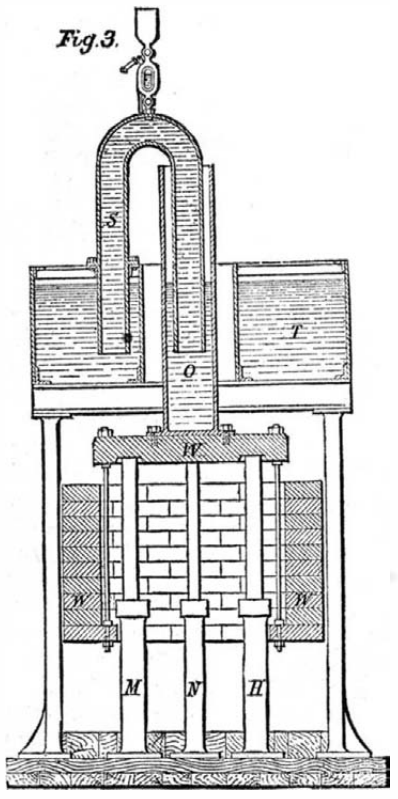
Each approach to the lift is protected by a powerful movable hydropneumatic buffer, as shown at G, one being closed and the other swung back to allow entrance or departure of the train from the lift. Each end of a lift is protected by a similar buffer. Any number of lifts may be placed side by side and worked in pairs, or preferably each lift independently with a differential compensating accumulator.

Figs. 3 and 4 show a sectional elevation and a plan of such an accumulator specially suitable for lifts requiring to be rapidly and economically manipulated. It has four principal presses, H, I, M, L, and two small auxiliary presses, K, N. On the tops of the rams strong crossheads are provided, to which are suspended the balance weights in the ordinary way, as shown at W. To the crossheads there is attached a compensating water tank, O, the area of which is made proportional to the areas of the rams, H, I, M, L, K, N. This tank is always kept in communication with the large fixed tank, T, by means of the siphon, S. The rams, H, I, M, L, alone are of such dimensions that when put in communication with the lift the weight, W, will descend, causing the lift to ascend to its full height, the rams, K, N, being idle during the downward travel of the accumulator and merely connected with the waste tank. When it is desired to lower the lift, the rams, K, N, are put in communication with the four rams, H, I, M, L, so that the pressure will be distributed over the six rams instead of four, and on opening communication with the lift the latter will descend. Thus the lift may be manipulated by the simple act of putting into and out of use the two small rams, K, N, and it will be evident that the only power wasted will be represented by the insignificantly small amount of water supplied to the presses containing the rams, K, N, once every double journey.

Many modifications of this accumulator have been arranged by the inventors, Messrs. Clark & Standfield, by which an increasing or decreasing pressure may be conveyed from the accumulator at any part of the stroke, thus making them of almost universal application where either constant or varying hydraulic pressure is required. These lifts are specially adapted to be used in connection with high level bridges and submarine or other tunnels alike for railway and road traffic, thus entirely obviating the difficult and enormously costly approaches otherwise necessary.—*Engineering.*







IMPROVED HYDRAULIC ELEVATOR FOR RAILWAY TRAINS.

The Mungoose in the West Indies.

Mr. D. Morris says that in all the West Indian Islands the black and brown rats are cause of great loss to the sugar planters, spite of rat catchers, with the bow string traps, and their aids in the shape of dogs and poison. Jamaica has also become possessed of the formidable and destructive *Mus saccharivorus*, an animal with a body ten inches long. To combat these pests, various animals were introduced, but the ferret succumbed before the attacks of the chigo; the Cuban ant (*Formica omnivora*), though it maintained itself and remains one of the planter's best friends, destroying the young of the rapacious rodents, also attacks kittens, puppies, and calves, and the agua toad devours young ducks, depopulates beehives, and drives away sleep by its croaking, but does not eat rats.

In 1872 nine mungooses were brought direct from India and turned loose. In ten years these have so multiplied that they are abundant all over the island, and are now found even at elevations of 5,000 feet. Cuba, Porto Rico, Barbados, and Santa Cruz have also been supplied with these animals, and their first patron, Mr. Espent, has undertaken to ship some to Australia and New Zealand to combat the rabbit pests. As a rat catcher this animal has proved itself worthy of its reputation, as it has reduced the expenses of rat catching fully 90 per cent, and has reduced the quantity of rat-eaten canes to one-fourth or one-fifth of what it was previously, representing an annual saving to the island of nearly £45,000. Notwithstanding this benefit, the short history of the mungoose upon the island goes to prove that the introduction of a new species into a district should not be done rashly. The mungoose is now too common, and is making itself felt in other ways besides rat catching. It to some extent preys upon eggs and chickens wherever dogs are not kept, and quail, wild guinea fowl, game birds generally, as well as sea and water fowl, are rapidly diminishing before its attacks, as are also the yellow snakes, themselves good rat catchers (*Chilabothrus inornatus*), and the ground lizard (*Amiva dorsalis*). As the mungoose cannot climb a tree, the rats, especially the black species, take refuge in cocoanut plantations, and prove more destructive than formerly; but, on the other hand, the coffee and cocoa plantations profit greatly by its introduction.

Benzoic Sulphinide, a New Sweet Compound.

Constantine Fahlberg, Ph.D., in a paper lately read before the Franklin Institute, says, in connection with an investigation upon the hydrocarbons of the coal tar group, it was discovered that a certain compound obtained by the oxidation of toluene-sulphamide with potassium permanganate tasted sweet. The sweetness was so intense that a few drops of the cold mother-liquor, remaining on and being partly washed off my hands, could be easily detected by the taste. As soon as I had discovered this property, peculiar only to this particular mother-liquor, the substance obtained from it was subjected to several tests in order to determine whether it was poisonous to take it in larger quantities or not. At first a cat and then a dog was subjected to this cruel treatment, but they remaining fortunately alive and apparently not in the slightest degree affected by it, I decided to take several grammes of it myself. The result was not the slightest inconvenience experienced from it. I subjected, the next morning, my urine to the chemical test, and found it to contain almost the entire quantity taken the previous night.

The compound which I now will exhibit to you forms salts with any carbonate of the alkalies, alkaline earths, or metals, and all of which you will find taste sweet. It is, however, not an acid, but belongs to a class of bodies which Professor Remsen and myself have given the name of "sulphinides," the compound in question being benzoic sulphinide. It is very readily soluble in alcohol, more so than in cold water, in which it only dissolves readily when it is hot.

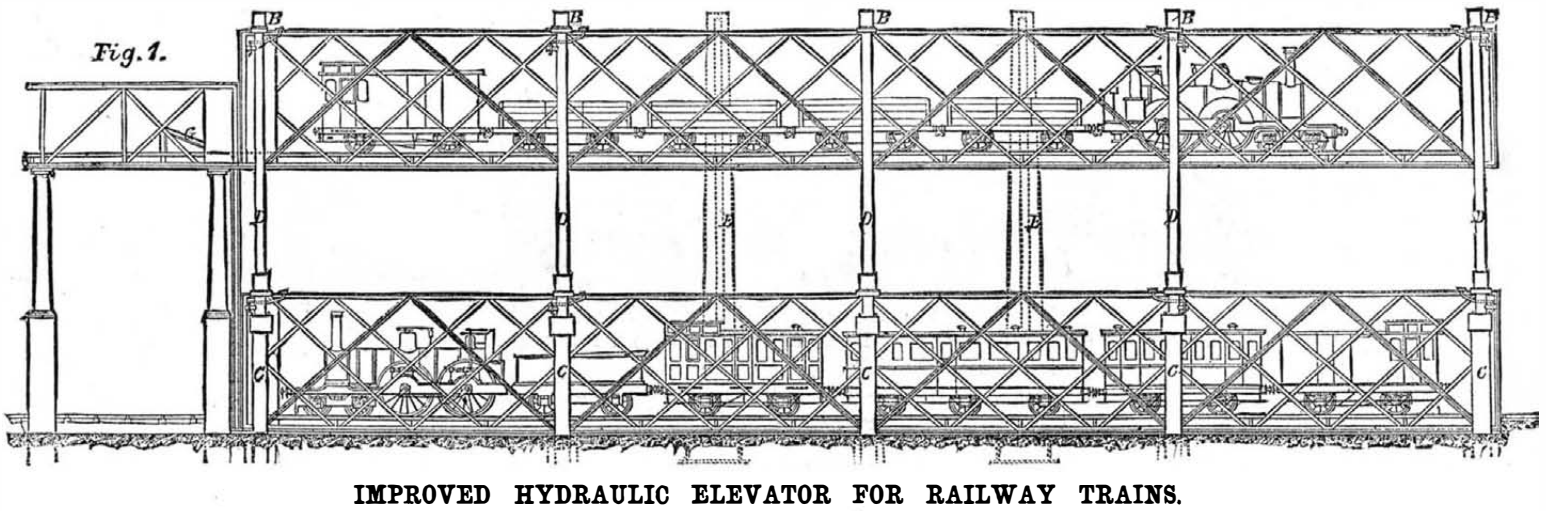
I am making the attempt now to prepare it in larger quantities and by cheaper methods, and have no doubt that it will find extensive use in medicine and for technical purposes. One experiment made lately was to sweeten glucose, which, as you all know, tastes only faintly sweet, and the result was a complete success.

As soon as I shall have found the method by which to prepare it on a manufacturing scale I shall come before you again, and, as I trust and hope, with larger samples than now, ready to give answer to all questions in regard to its price, application, etc.

An Odoriferous Accumulator.

Mr. W. H. Preece thus speaks of a new accumulator that he saw at the recent Munich Electrical Exhibition: It was the invention of Herr Shulze, of Strassburg. The novelty is that Herr Shulze takes his lead plates and coats them with a thin superficial layer of plumbic sulphide (PbS). The lead plates, very finely grooved, are heated in sulphur, in what form I do not know, but they come out coated with a superficial layer of what we used to know as the black sulphuret of lead; this is put into a bath of sulphuric acid, and the result is that there is sulphide of lead opposed to sulphide of lead, through which the current goes, with the result that on the one plate the hydrogen and the water combine with the sulphur, forming that sweet and delightful perfume called sulphureted hydrogen; indeed, the effect of the current on this plate in producing sulphureted hydrogen was only too evident in the neighborhood of this secondary battery, for the smell of rotten eggs is sweet to the odor of Herr Shulze's secondary battery. When the operation is complete, and when everybody is driven away, then it is said that the battery is ready for action.

Each cell when complete weighs 23 pounds, and it takes a current of 4 amperes for 60 hours to form it. The efficiency is small.



IMPROVED HYDRAULIC ELEVATOR FOR RAILWAY TRAINS.

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NEW FEED WATER HEATER AND LIME EXTRACTOR.

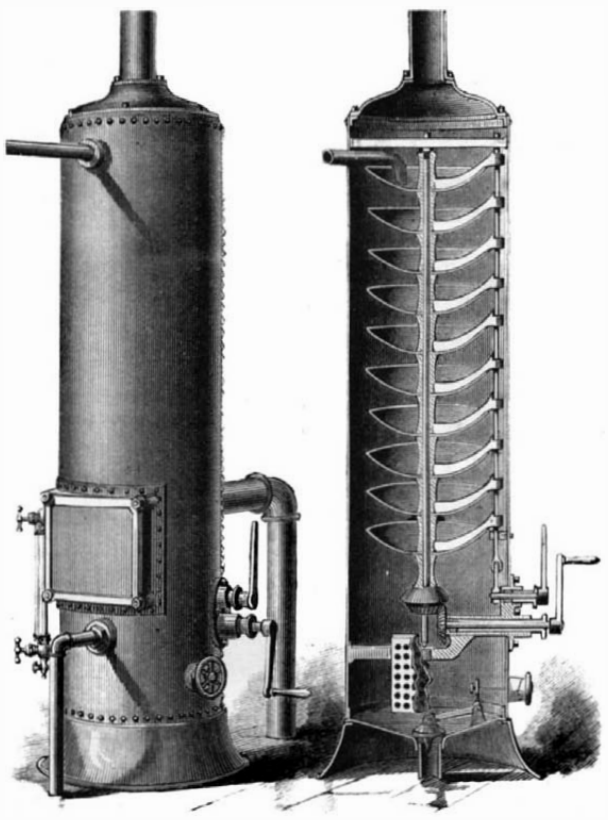
Many ingenious devices for heating the feed water in its passage to the boiler—a few acting as lime extractors—have been manufactured and sold for years; and while a few of them act apparently well as heaters, fewer succeed as lime extractors, and they all fail in most cases to extract enough of the impurities to prevent incrustation; even where the boilers have the most careful cleaning and attention, the great majority of heaters, mostly expensive pipe arrangements, only suffice to make the water moderately warm. The main fault in the lime extractors is generally that they lack heating and depositing surface, and have no provision whatever for extracting the lighter or finer impurities, which defy filtration, and which once incrusted in a boiler adhere firmly, making a very hard scale, which is almost impossible to remove without injury to the boiler.

Another great disadvantage in working one of the old style of lime extracting heaters is that too much time is required in the operation of cleaning them. Any lime extracting heater should be cleaned often and well, to insure the best results. The engraving shows a heater and purifier, which besides providing a new principle for extracting impurities both of the lighter and heavier quality, provides an apparatus for cleaning that performs its work perfectly in a few minutes, and while the engine is running.

The exhaust steam from the engine enters at the back of the heater, about one-third of the way up, and passes out at the top. The water is conveyed into the heater at the top by a pipe leading from the tank, having a suitable stop cock for its regulation; on entering the heater, the water is carried downward into the top bowl, and flowing over the edge follows the under surface to about the center, before dropping into the next bowl. In like manner the water passes downward over each bowl in the series, to the reservoir below, from which it may be drawn off by a pump. It will be easily seen that the water in its downward passage is continually brought into direct contact with the ascending current of heat and steam, thus heating the water to the highest degree attainable without back pressure. As the water becomes heated to the boiling point directly after it enters the heater, the lime, magnesia, clay, mud, iron, sulphur, silica, sand, etc., are set free, and deposited on the bowls; the heavier matter settles mostly on the inside, while the lighter impurities cling to the under sides of the bowls or receivers.

The heater is easily cleaned in a very few minutes, even while the engine is running, by opening the valve in the bottom and rotating the bowls by means of the crank; this will scrape the sediment loose from the interior of the bowls; the scrapers are then raised up by means of the lever, and the bowls rotated as before, thus scraping the adhering material from their under sides; the scrapers are then brought to a central position, and the bowls revolved rapidly, thus throwing the water and sediment out of the bowls by centrifugal action into the reservoir below, from which it is carried off by the waste pipe at the bottom. The water is then admitted and the bowls filled, when they are rinsed by the same process. This operation is repeated until only clear water comes from the waste pipe.

Further information in regard to this useful invention may be obtained by addressing the inventor, Mr. John J. Hoppes, Springfield, Ohio.



HOPPES' FEED WATER HEATER AND LIME EXTRACTOR.

Tracing Contagion.

A number of cases in the same herd, owned by a farmer at Salem, N. J., having died very suddenly, the veterinary surgeon submitted a specimen of the blood from the last victim to Professor Leidy for microscopical examination. The animal was apparently well on one evening, and was milked as usual; it died the next morning. The cause was not clear, but was suspected to be the result of anthrax or splenic fever. A post-mortem examination was made the following day; and the abdominal viscera were found much congested, especially the spleen, which was gorged with blood. The specimen of blood from the spleen was examined and found to be teeming with bacteria of the form known as *Bacillus anthrax*, which is now viewed by most competent authorities as the cause of anthrax. The bacilli were actually more numerous than the blood corpuscles, which appeared unchanged.

This case shows that milk is forwarded to market drawn from cows which are within a few hours of their death from splenic fever. Such milk can hardly be wholesome, and doubtless contains the bacilli capable of giving contagion.

Let us hope that the fat from the carcasses of such animals is not sent to the nearest oleomargarine manufactory, as this substance is rendered only at a temperature under 120°, by the patent which is now supreme. We need not state that the thermal death point of bacilli is far above such a temperature, and we leave our readers to draw their own conclusions respecting the results when such uncooked animal produce is used as an article of diet.—*Medical Record.*

Hot Water Cure for Sickly Plants.

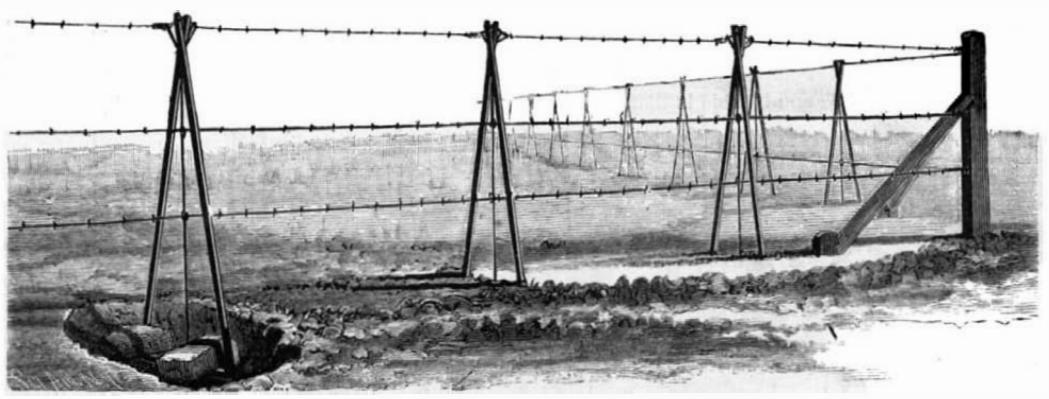
The *Florist* asks: Has any one tried hot water as a restorative for sickly plants? and then proceeds to say that M. Willermoz some time since related that plants in pots may be restored to health by means of hot water; ill health, he maintains, ensues from acid substances in the soil, which, being absorbed by the roots, act as poison. The small roots wither and cease to act, and the upper and younger shoots consequently turn yellow, or become spotted, indicative of their morbid state. In such cases the usual remedy is to transplant into fresh soil, in clean pots with good drainage, and this often with the best results. But his experience of several years has proved the unfailing efficacy of the simpler treatment, which consists in watering abundantly with hot water at a temperature of about 145° Fah., having previously stirred the soil of the pots so far as may be done without injury to the roots. Water is then given until it runs freely from the pots. In his experiments the water at first came out clear, afterward it was sensibly tinged with brown, and gave an appreciable acid reaction. After this thorough washing, the pots were kept warm, and the plants very soon made new roots, immediately followed by vigorous growth.

IMPROVED FENCE POST.

The annexed engraving shows a very simple and inexpensive post for wire fences. It is made of $\frac{7}{16}$ round iron, each post requiring about twelve feet of the rod, which is bent up in the form of an isosceles triangle, with the upper ends crossed and notched to receive each other, or they may be welded.

The base of the post, which is about two feet wide, rests upon two stones or bricks, one at each end, and is anchored by a stone or brick placed above the rod near the angles. The post is planted about one foot in the ground, and a galvanized wire attached to the center of the base and secured to the top of the post. This wire is wound around the horizontal wires, and holds them rigidly in position. This wire also serves to bind the top wire of the fence, which rests in the fork at the top of the post. The lower end of the post is galvanized to prevent rust, and the upper end is painted or coated with coal tar. Of course the entire post may be galvanized if desired. This post, used in connection with the ordinary fence wire, makes a very strong and durable fence at a comparatively slight cost.

Further particulars in regard to this invention may be obtained by addressing the patentee, Mr. A. B. Smith, Box 283, Abilene, Kan.



SMITH'S IMPROVED FENCE POST.

Substitute for Hydrogen in the Lime Light.

The rapidly increasing use of the lantern in schools, public lectures, and exhibitions has led to a number of experiments to reduce the cost of the lime light. In point of power and general usefulness nothing better, except electricity, has been found than the combination of hydrogen and oxygen in a single frame thrown against a piece of lime. In a few large cities the gases are easily obtained in commercial quantities, stored in iron tanks, ready for use, and at comparatively low prices.

The tanks are troublesome to carry, and in smaller towns the gases must be made on the spot as required, and this involves expensive and troublesome apparatus. Every effort has been made to find a substitute for one of the gases. Street gas, alcohol, and other things have been tried in place of the hydrogen, but with a decided loss of light. Common ether has been tried several times, but has been considered too dangerous. More recently an apparatus for saturating the oxygen with the vapor of ether has been devised, that appears to remove all danger of explosion and to give an excellent light.

The apparatus consists of two strong brass cylinders, placed side by side upon a wooden support. These are open at one end, and have brass nipples at the opposite ends for receiving the gas tubes. In each tube is placed a cylinder or roll of loose fabric, like flannel, having a small hole in the middle. These rolls fill the cylinders completely, fitting tight, and leaving only the small passage for the gas through the center of the material. Common photographic ether may then be poured into the cylinders till the wick-like filling is completely saturated, and then the excess of liquid is poured off and put back in its bottle. Two rubber caps, joined together by a short tube, are then fitted over the ends of the cylinders, and to one of the nipples is fitted the gas tube from the oxygen holder or tank, and to the other a tube leading to the burner.

The oxygen for the burner is supplied by a third pipe. To use the light the oxygen is first turned through the cylinders, entering the rear of one and passing, by means of the short tube, to the next, and so on to the light. On its passage enough vapor is absorbed from the wicking to give a good flame at the jet, and when the oxygen jet is added to it, a light is obtained that, as far as observation goes, is quite as good as the ordinary lime light. The striking back of the flame, and consequent explosion of the ether gas, when the gas is suddenly shut off, is said to occur but rarely, and with proper care it need never happen. However, to prevent all serious results of such an explosion, the rubber caps and tube joining the two cylinders are put on very lightly, and if there is an explosion the caps will be blown off before any dangerous pressure is reached.

The invention has the merit of saving all the trouble of making or carrying hydrogen, as the whole apparatus can be carried in the hand, while ether can be obtained anywhere. One filling of the cylinders will last about ninety minutes, and a quart of ether will give a light for five hours. —*Century Magazine for March.*

The Combustion of Air in Coal Gas.

In a lecture experiment exhibited recently before the Newcastle upon Tyne Chemical Society, Mr. J. T. Dunn, M.Sc., said: There is nothing very new in this form of the apparatus, save that it is handier than most forms in use and does not require any reservoir of air. It consists of an ordinary Argand chimney mounted on a stand of convenient height. The upper end of the glass is covered by a cap of wire gauze, in the center of which a hole of about four or five mm. diameter has been punched. The lower end is fitted with a cork pierced with a hole in the center, through which passes a glass tube level with the cork beneath, and projecting twenty or thirty mm. above its upper surface into the lamp glass; this tube preferably ends in a wide jet of rolled platinum foil. Two other holes in the cork, symmetrically placed on either side the center, through which pass short tubes joined by a T-piece and India-rubber tube to the gas supply, serve to feed the apparatus with coal gas. The gas is turned on and lighted above the gauze. A narrow glass tube is pushed up through the open tube in the cork and through the hole in the middle of the gauze into the coal gas flame. On gently blowing through this narrow tube (which for convenience should have a flexible India-rubber tube attached to it), the breath catches fire at the coal gas flame, and the tube may then be gently withdrawn, when its little flame ignites the air entering the apparatus by the short open tube. The draught of the flame furnishes quite enough air to burn; and the apparatus, once lighted, will continue to act as long as the supply of coal gas is kept up. The best air flame is got by diminishing the gas supply to the lowest point consistent with the continued existence of the air flame.

GERMANY produced in 1881, 2,914,009 tons of pig iron, 560,222 tons of castings, 1,421,792 tons of wrought iron and steel, and 894,425 tons of cast steel.

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Flanging Steel Plates Cold by Hydraulic Pressure.*

A pair of moulds were made to fit a hydraulic press, capable of exerting a pressure of about two hundred and fifty tons. They were so shaped that at one operation they would make a flange both on the outside and inside of an annular steel plate, and thus produce a double flanged annulus. A taper was given to the moulds, to facilitate the removal of the plate after flanging. There was a slight hollow, ⅛ inch deep, formed on the annular face of the upper mould, and a corresponding rounding on the lower one, to flatten the face of the plate. Experience showed that in this mould, and also in the second mould, a depth of $\frac{1}{16}$ inch would have been sufficient.

The plates were Landore Siemens S.S. quality, ⅜ inch thick. Their edges were beveled in the lathe to an extent of ⅛ inch in the thickness on the inside, and $\frac{1}{16}$ inch on the outside edge; after flanging, a slight bevel suitable for calking still remained. Both the outside and inside circles were cut out in the lathe. These first moulds not proving altogether satisfactory, they were altered in shape, and turned on the working faces. The first plate was successfully flanged cold, with a pressure of about two hundred and fifty tons. In the second plate a little deeper flange was attempted, but it cracked at the inner flange. A plate of S. flanging quality was then annealed and tried cold; but it cracked in six places on the inner flange. A similar plate not annealed also cracked, but in one place only.

Some more S.S. plates were then ordered, specially for this work, and were flanged cold and unannealed. The first one cracked in the inner flange, but this was probably due to an attempt to get a very deep flange, standing up about $2\frac{9}{16}$ inches from the under side of the plate; the next, with a flange of about 2⅜ inches deep, did not crack. The third cracked at the bend of the external flange, on the outside, showing a crack about three inches long nearly through the plate. A plate annealed for about four hours, and pressed when cool enough to be held in the hand, cracked badly at the inner flange. Two others, annealed for about sixteen hours, turned out quite sound.

A batch of twelve, heated in a plate furnace and cooled in ashes for forty-eight hours, were then flanged with perfectly satisfactory results, there being no sign of cracking even on the inner edge of the hole, where the best unannealed plates had shown slight signs of skin cracks, started, no doubt, by the roughness of the sharp edge. Another lot were annealed for about sixteen hours; but having had a thick layer of ashes over them, they were still warm when pressed. Out of four which were flanged two cracked, one slightly on the inner edge and one badly. The rest of these were put back to be carefully reannealed, and out of the fourteen twelve were sound.

In all these annealed plates the actual duration of the flanging process in the mould had been very short, from ¼ minute to ½ minute. Another lot of twenty-one plates, thorough annealed, were now flanged, allowing the operation to extend over about 3½ minutes; and at the same time the ragged edge round the hole was carefully filed off, so as to give no starting place for a crack. The result appeared to be satisfactory, as only two cracked, and those not badly. The approximate thickness of the edge of the external flanges was $\frac{13}{32}$ inch, showing an increase of $\frac{1}{32}$ inch; that of the internal flange was $\frac{5}{16}$ inch, showing a reduction of $\frac{1}{16}$ inch.

The average pressure required for the annealed S.S. plates was about two hundred tons. It would seem, as a general result, that for cold flanging, involving compression only, as on the outer flange, these plates, even of the lower or S. quality, are perfectly trustworthy, even unannealed; as only in one case did a crack appear in the external flange. But for flanging involving considerable stretching of the material, as on the inner flange, only S.S. quality will do at all, and the slightest irregularity in the metal will cause a crack. The results showed that this might be expected in from ten to fifteen per cent of the plates.

* Communicated to the Institution of Mechanical Engineers by Messrs. Easton and Anderson.

Native Potatoes.

Native potatoes have been discovered in Arizona by Prof. Lemmon. They were found in a cleft of one of the highest peaks north of the Apache pass, under a tangle of prickly bushes and cacti. Eager to know if the Solanum found was bulb bearing, he carefully uprooted the little tuber, which proved to be an undoubted representative of the true potato family. According to the researches and reasonings of Humboldt, this was the location to look for the home of the species from which our first potatoes sprang. In May last, Prof. Lemmon again set out in search of more specimens, choosing the Huachuca Mountains as his point for exploration.

These mountains have two peaks over 10,000 feet high, with sides furrowed into deep canons, those of the northeast being filled with trees, among which are maple and ash. In July last he discovered the potato plants he was searching for on the southwest side of the range, hidden among the rich bottom soil of a dell in a high valley. A few plants of the white species were found in full bloom, and farther on blue blossoms were found. The white flowered specimens formed tubers on shorter subterranean stems than the blue ones. The blue flowered potato plants sent off their runners from 18 inches to 2 feet. July 12, they were in full bloom.

The blossoms were large, and the white flowered were of a creamy white color, with greenish midribs to its corolla lobes. The subterranean stems were not longer than those of our common potato. The blossoms of the blue flowered are smaller, bright purple, with pale white midribs to the corolla, with fifteen to twenty flowers to a head. They are found at an altitude of about 8,000 feet in Tanner's canon, and some of the plants were 2 feet high. Later in the season they produced potato balls of unusual size, comparatively speaking.

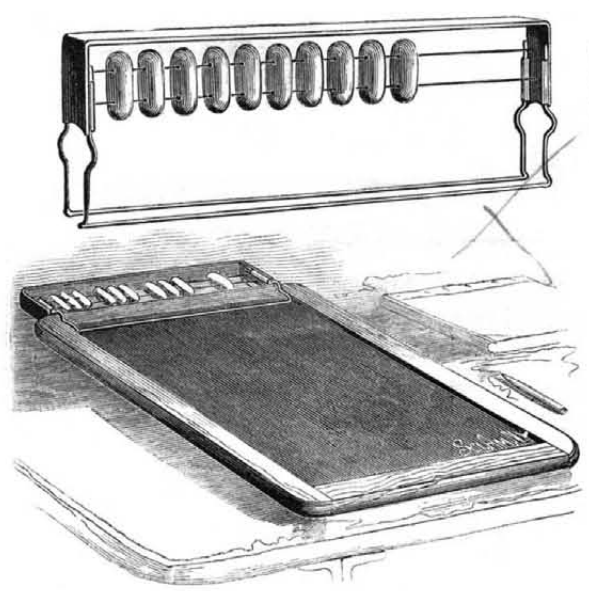
These native species of potatoes, which may have been and very likely are the original native stock from which all our potatoes now used have sprung, deserve a fair trial and careful propagation to develop them to the size now attained by our best potatoes. By the 1st of September the blue flowered plants formed bluish colored potatoes, oblong, about 1½ inches long by half as wide, and a third as thick, with from four to ten unmistakable potatoes on each plant. The white flowered plants produced white potatoes, nearly round, from half an inch to 1 inch in diameter. These potatoes are unquestionably indigenous.

Still another variety was found near the summit of a peak 10,000 feet high, under the shade of fir, pine, and poplar trees, growing in soil kept moist during the greater part of the year by melting snows. Its nodding balls of ripened seeds were surrounded by golden-rods and brilliant asters. Their tubers were tinted with purple, and seed balls were either solitary or in pairs. Prof. Lemmon brought back with him over three quarts of these small potatoes, comprising the different varieties, besides some seed balls.

A hermit in these mountains, whom Prof. Lemmon interested in his discovery, has recently written him that in digging up the bed of an old pond he has secured a lot of these potatoes, perfectly white, as large as hen's eggs, which on becooked tasted well, and have all the appearance of very fine potatoes. Various cultivators have manifested the utmost interest in Prof. Lemmon's discovery, and are making careful preparations to cultivate the specimens he has forwarded them.—*Pacific Rural Press.*

ABACUS ATTACHMENT FOR SCHOOL SLATES.

This invention is designed to facilitate the acquirement of the elements of arithmetic by young children. As is well known, in the best schools, those in which the method by



STEWART'S ABACUS ATTACHMENT FOR SCHOOL SLATES.

object teaching prevails, there is found a large abacus which is wheeled about the school-room, and a small one which is held in the hands of the teacher. The scholars, however, have heretofore been provided simply with pebbles or other loose counters, from which they have derived incalculable assistance, as in grouping the pebbles in order to illustrate addition, subtraction, etc., the eye of the young child assists his mind in forming just estimates of arithmetical quantities and processes. But the use of pebbles or other similar loose counters is attended with inconveniences. They take time and trouble in distributing them to classes and collecting them after recitations. They drop and make a noise, or they get mislaid, and confusion is created before they are found. Besides which they might prove a source of danger to children who have a habit of placing small objects in their mouths.

It is to obviate these difficulties that the "abacus attachment" shown in the engraving has been designed. The attachment is simply a set of counters strung on a wire or wires set in a frame which can be fixed to any slate in a moment, by means of spring brass wire clips. The frame can be of brass or wood, and the counters and wires as many as desired.

The abacus frame is of brass, and though light and graceful it is strong enough to outlast a dozen slates. At examinations it could, if desired, be instantly detached and laid aside. Not being a part of the slate frame, the destruction of the slate would not render it useless. It would simply be transferred to the next slate. It could be introduced into a school without inconvenience, as it can be made to fit any slate.

It thus seems to solve the problem of providing a far more convenient and easily handled set of counters than has yet been placed in the hands of young children, and it incidentally relieves the teacher of an appreciable amount of trouble. This invention has been patented by Mr. Henry Stewart, 254 W. 9th Street, Erie, Pa.

The Berthoud-Borel Electric Cable.

Mr. G. J. Lorrain gives the following particulars, derived from a visit to the factory in Switzerland, where the cables are made:

The insulating material now employed is formed of oxidized linseed oil specially treated. Oxidized linseed oil: that is, linseed oil heated in contact with air until it assumes a gutta-percha like mass, has, I believe, been tried before, but as an insulating material it is far from perfect. By the Berthoud-Borel process, however, a very excellent and cheap insulating material is obtained. Linseed oil is gradually heated up to a temperature of about 610° Fah., and at a certain stage of the operation, which the workman recognizes by the appearance which the viscous mass presents, colophane treated with oil is added, and the operation continued till the desired consistency is attained. A firm, coherent, and elastic substance resembling India-rubber is obtained.

The most interesting and by far the most important feature in connection with these cables is the method of manufacture and the machinery employed therein. The cables are not manufactured first and then inserted in lead coverings. The process is almost entirely automatic; you literally see the wire passing into the machine at one end and issuing at the other in the form of a complete cable, protected by its lead sheathing. The lead is put on in a molten condition, and the cables can be made of any desired length, however long. When the cable is meant to be laid under ground, it is passed through the lead press a second time, receiving a second coating of lead, with a thin coating of gas tar between the two. Cables thus formed can be laid underground without being incased in iron pipes, and without further protection. The insulating material employed, as it is not effected by alternations of temperature, admits of these cables being laid in troughs along the curbs of the streets, and close to the surface.

A noticeable feature of the factory is its quiet and holiday aspect. This is due to the small number of workmen required to look after the machinery.

Crackled Glass.

The *Moniteur de la Céramique* gives the following description of Bay's process for making the new kind of glass which is smooth on one side and rough on the other—*Craquelé Indien*. The roughened surface of the glass looks as if it was covered with cracks, and this appearance is obtained by spreading over the surface of a plate of glass a thick layer of some flux or easily fusible glass that has been made fluid or pasty and mixed with coarser pieces. The glass is then put in a muffle or an open furnace and strongly heated. As soon as this flux is melted and the glass itself becomes red hot, it is taken out of the furnace and rapidly cooled. This flux or fused glass then cracks off from the other glass which was attacked by it, leaving numerous depressions in the latter resembling scales and irregular crystalline forms, crossing and intersecting each other and producing very beautiful effects when the light falls upon it. This fusible layer is cooled as rapidly as possible, either by a current of cold air, or by carefully sprinkling with cold water.

If some portions of the glass are protected from the action of the flux, the surface remains smooth there in striking contrast to the crackled portion. This can be utilized in making arabesque, letters, and other designs on a white or colored ground.

A similar crackled glass is made in another way, by strewing a coarsely grained flux on a cylinder of glass while still red hot, and then putting it back in the heating furnace until the flux melts. It is then rapidly cooled, either by sprinkling water on it or waving it back and forth. The layer of melted flux then cracks off and exposes the surface of the glass which has been corroded by it. The cylinder is then cut and spread out in the usual manner.

The Oldest Locomotive Engineer.

Frederick Lunger, who died at Davenport, Iowa, a few days ago, aged seventy-five years, is said to have been the senior railroad locomotive engineer in the United States. According to the New York *Tribune*, his first experience in that calling was in 1835, on the Albion, an engine built by George Stephenson and run on the old State road from Philadelphia to Columbia, Pennsylvania. He remained constantly at the work of "engine driving" until 1856, when he retired to farm life. In 1876 he was invited by the late Colonel "Tom" Scott to visit the Exposition at Philadelphia, and on his way there and back again to Davenport he rode in his old place in the cab, and handled the lever as skillfully as ever, thus literally working his passage, although his pockets were full of first class passes over all the roads.

Professor Palmieri.

The death is announced of Signor Luigi Palmieri, well known in connection with the observatory on Mount Vesuvius. Although better known as an observer of earthquake phenomena, Professor Palmieri was not unknown in the electrical world. *L'Electricité* says that we owe a simple form of electrometer to him, constructed on the same principle as that of Pelletier. He applied his instrument to the construction of an original apparatus, designed to discover the frauds perpetrated by the venders of olive oil in Italy. M. Palmieri had peculiar ideas as to the production of electricity. He thought that the condensation of the vapor of water disengaged large quantities of it.

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Correspondence.

A Meteor in Mexico.

To the Editor of the Scientific American:

On the 7th instant, at about two o'clock in the afternoon, as I was writing in my office, I heard a rushing noise in the air exactly like that made by a sky-rocket as it ascends in the air. I could see nothing, as I was then inside of the house, but other persons, who heard the noise, informed me that they saw a ball of light, which traversed the sky from east to west. The sky was clouded at the time, and it was drizzling, and a heavy wind was blowing from the north. I suppose this must have been a meteor, and that it fell somewhere near here.

CHARLES WINSLOW, *United States Consul.*

United States Consulate, C. Guerrero, State of Tamaulipas, Mexico, March 10, 1883.

How to Make an Æolian Harp.

To the Editor of the Scientific American:

Apropos of your recent article on the subject, perhaps some of your readers may be interested in knowing how to make an Æolian harp as cheaply as possible.

It consists, when finished, of a thread held taut just above the long narrow opening at the middle of an ordinary window, by two wedges pressed firmly down between the upper and lower sashes.

The thread may be from eighteen to thirty inches in length, and may be fastened by making a knot in the end and drawing it into a longitudinal split in the top of the wedge; and sufficient tension may be obtained by separating the wedges to the proper distance while pressing them down.

Enough air will come up through an opening one-sixteenth inch wide to operate the harp, provided the wind is blowing against that side of the house.

Several threads may be fastened between the same pair of wedges if desired.

Any kind of thread may be used, and, for a louder tone, a fine wire may be substituted for the thread.

To the young physicist and musician this simple monochord will be a help in the study of harmonics.

S. F. P.

East Chatham, N. Y., March 5, 1883.

The Egyptian Obelisk in Central Park.

To the Editor of the Scientific American:

During a recent visit to New York, I took occasion to examine the obelisk in Central Park, and the opinion I formed is so at variance with the general and accepted one in regard to its construction, that after several days' reflection on the subject, I have determined to write you. I have been looking up in the SCIENTIFIC AMERICAN SUPPLEMENT (of which I have a copy of every issue), and I find in February, 1881, you wrote up the whole thing, giving illustrations, etc. In that article you also state that the obelisk was taken from certain granite quarries, thus showing it to be a natural stone. Yet in spite of all this, to me, excellent authority, I cannot believe it to be a natural stone, and I want to give you my reasons for so thinking, and if you find enough in what I have to say to induce you to take any notice of it, whether to substantiate or upset my theory, makes no difference; I only want to get at the facts. My reasons for believing the obelisk to be a mass of concrete are as follows:

I have spent a lifetime in the manufacture of limes and cements, and in the study of mortars, concretes, etc., and after thirty years spent in this line, it seems as though I ought to know concrete when I see it.

I went around on the back side of the obelisk, climbed over the wire fence, mounted the masonry work, took out a strong magnifying glass and a sharp pointed steel, and went at it.

I could see what looked at a distance to be a gray, reddish, uniform tint, was, on close inspection, granite broken into pieces from the size of a walnut down to corn or wheat size, and these broken stones were intimately mixed with some bituminous matter, black and seamy, something of the nature of asphaltum. The black substance and broken stone were thoroughly mixed with hydraulic lime; by the latter I do not mean hydraulic cement, but lime which contained sufficient clay to render it hydraulic, but not enough to prevent it from slaking if kept under water eight or ten days. The hydraulic lime is light in color, with a slight yellowish tinge peculiar to all true hydraulic limes; such limes withstand the action of the weather much better than the best Portland cements. With my steel point I could plow out this hydraulic lime, and with my knife I cut and shaved the black substance, which lay in all conceivable ways, the grain in some bits presenting their flat sides, sometimes their ends, sometimes vertical, sometimes horizontal, showing it to have been mixed up with the lime and broken stone haphazard. The lime showed in such thin streaks that it is evident that the men who had made the obelisk knew how to make concrete. I think, if I had had time enough and no policemen to nose around and bother one, I could have taken out a bit of granite with my steel.

The hieroglyphics show, as plain as anything can show, that they were formed by fastening the proper forms on the inside of the box into which the concrete was rammed, and when the concrete had hardened sufficiently, the boxes were taken away, and the patterns of the hieroglyphics were withdrawn, leaving their impression on the face of the concrete, exactly as is done every day by manufacturers of artificial stone. Such work cannot be mistaken for work done by the chisel by any one familiar with that class of work. Every letter is made to "draw," and in no place could I find a spot among all the hieroglyphics where a pattern would not "draw." Such a structure, made in concrete as I have described, could be safely carried up at the rate of from 12 to 15 inches per day, and so positive am I that it is concrete, that I would not hesitate to enter into a contract to erect exact duplicates of it in any city for $15,000 each. I think I can find granite in Connecticut of the same color, the bituminous matter in New York, and the hydraulic lime in Buffalo, and with these make just as good obelisks as were ever turned out in Egypt. As to the durability of the obelisk in Central Park, of which much has been written lately, I think it will stand for ages where it is. Some portions may get loose that were not perfectly cemented, but as a whole the material is of that class that will outlast anything else we have. If it were Portland cement or Roman cement in the place of the hydraulic lime, I should say it would disintegrate in a few years, but not so with the true hydraulic lime, of which that in the obelisk seems to be an excellent type.

U. CUMMINGS.

Buffalo, N. Y., March 8, 1883.

New Photo Printing Process.

At a recent meeting of the Photographic Society of France, the chairman informed the members that a letter had been received from MM. Ch. Cross and Verger concerning a photographic process which these gentlemen had presented at the last meeting of the Academie des Sciences. The inventors of this process obtain direct positives by the following means: Paper properly starched is floated on a bath composed of—

Water	100 parts.
Bichromate of ammonia	2 "
Glucose	15 "

When dry it is exposed to light under an image forming a positive. As soon as those parts of the paper unprotected by the *cliché* have changed their color from a yellow hue to a grayish tint, the exposure is deemed to be sufficient. The paper is then floated upon the following solution:

Distilled water	100 parts.
Nitrate of silver	1 part.
Acetic acid	10 parts.

The image will appear immediately of a blood red color, being composed of silver chromate, which, being insoluble in water, permits the paper to be well washed in order to eliminate all the bichromate unacted upon by light.

On every part of the paper upon which the chemical influence of light has acted the bichromate has become reduced, accelerated by the presence of the glucose; therefore every part or shade of the *cliché* will be faithfully represented. If the paper be dried before a fire and in the dark, the image will be of a blood red color; if dried in the open air, the light will change the color to a dark brown tint; if exposed to the emanations of hydrosulphuric acid, or plunged into a solution of sulphite of copper and potash, the image will turn to a brownish black hue.

A Monarch of the Forest.

H. Tabor & Sons, Manistee, Mich., write that they recently cut a pine tree, at their camp in Section 21, Township 25, Range 5, on the Big Manistee River, that was 164 feet long, 100 feet from the ground to the first limb, and as round as a dollar. Eight logs were cut from it that measured as follows:

Length, feet.	Diameter, inches.	Scale, feet.
16	42	1,444
16	41	1,369
16	41	1,369
16	39	1,225
16	37	1,089
16	36	1,024
14	29	547
16	25	441
Total, 126		8,508

It would seem that 8,508 feet is about enough for the logs of one tree to measure, even if none of them got away; but in this case the returns are imperfect, from the fact that the log, which would have made two more logs, was so badly broken as to render it of no value. Tabor & Sons are of the opinion that this is the largest tree ever cut on the river. —*Northwestern Lumberman.*

Ethylene in Refrigerating.

Cailletet's experiments show that ethylene is liquefied under the following pressures and temperatures:

60 atmospheres	10° C.	50° F.
56 "	8° C.	46·4° F.
50 "	4° C.	39·2° F.
45 "	1° C.	33·8° F.

Its critical point is about 13° (55·4° F.), while that of carbonic acid is about 31° (87·8° F). These properties induced him to see whether liquefied ethylene would not give a more intense cold than that which corresponds to the ebullition of protoxide of nitrogen. By slightly modifying the apparatus which he used for liquefying oxygen, he succeeded in producing a more intense cold than had been previously realized. Ethylene, moreover, possesses the property of remaining liquid and transparent under temperatures at which nitrogen protoxide and carbonic acid become solid and opaque. He hopes to obtain still greater degrees of cold by condensing gases which are more difficult to liquefy than ethylene. —*Comptes Rendus.*

Green Bearded Oysters.

For some time past it has been reported that the oysters taken from the Shrewsbury River beds were diseased and afflicted with what is known as "green gill." Mr. Eugene Blackford, one of the New York Fish Commissioners, has had specimens of these oysters examined under the microscope by Prof. H. J. Rice, of this city, with the following result:

He found that the digestive organs of the oyster were filled with minute fragments of marine plants, or algæ. The presence of this substance gave the mouth or beard of the oyster a greenish hue. The body of the bivalve was of a natural color. It had been feared that this peculiar appearance was due to the contact of the oyster with copper in some form, but the experiment showed that this could not be the case. In Europe green oysters are very common, and careful experiments have been made there by Professor Sullivan to discover the cause. He analyzed the mud from which they were taken, but did not find any indications of the presence of a metallic substance. He then placed some oysters in a solution of copper and found that they readily assimilated it. Its presence was detected by the body assuming a bluish-green appearance, while the beard remained of its natural color. When the oysters were fed on algæ, the beards gradually turned green without the rest of the body being affected.

On being provided with their natural food, which principally consists of microscopical organisms known as diatoms, the mantle returned to its ordinary color.

Mr. Blackford states that he had noticed the same thing in oysters coming from Virginia, and also that some taken from the vicinity of Staten Island were likewise affected, but that it was principally confined to the Shrewsburies.

The greenish tint has caused much prejudice against such oysters, but there does not seem to exist the slightest grounds for it. The green gill is not, according to the expert's report, the symptom of any disease; in fact, oysters seem to thrive that feed on algæ, which produces the objectionable color.

Mr. Blackford has made arrangements with Prof. Rice to examine daily the fish received at the Fulton Market, in this city, for the period of one year from the first of next June, and we look forward to some important discoveries as the outcome of these investigations. In the examinations the viscera of the fish will be removed and carefully dissected; the size, weight, time, and place of capture will also be noted. The mint and roe will be removed as well as the contents of the stomach, all of which will be subjected to the most careful microscopic examination.

Owing to much conflicting testimony as to the habits of the bluefish, striped bass, and other salt water fishes, satisfactory laws have not been passed for their protection, but Mr. Blackford expects that his investigations will result in establishing many facts in regard to the habits of our sea fishes which heretofore have not been known.

Mortality of Paris.

According to the recent census, Paris has a population of 2,239,928. The total number of deaths for the week ending January 4, 1883, was 1,099, of which 306 were under five years of age. There is an erroneous popular opinion that very few births take place in Paris, but for the same week the number of births exceeded the number of deaths by 56, whereas in New York city the number of deaths generally exceeds the number of births. The number of legitimate births exceeded that of the illegitimate in the proportion of 852 of the former to 303 of the latter. In Heidelberg the average number of illegitimate births is about *one-third* of the whole number of births.

For the week ending November 23, the proportion of births to that of deaths was as 1,242 to 1,071, an excess of 171 births, while for the week ending December 14, the number of births showed an excess of 137.

The number of marriages is, however, small, ranging from 381 to 403 per week at the periods above referred to.

In all cases the death list shows a decided preponderance of males, the largest number being due to consumption, which is followed by cerebro-spinal meningitis.

Concentrated Writing Ink.

A new article of manufacture in the shape of an ink paste has been recently introduced to the stationery trade. The ink is put up in packages of sheets of the composition, divided into squares, each of which squares, when immersed in about two thimblefuls of water, produces, it is said, a brilliant fluid flowing ink. About ten years ago a patent was obtained by a gentleman in this city for making an ink paste, of every variety of color, and this newly introduced article is probably the result of the ten year-old patent, which until now has remained comparatively dormant. There is almost always a time in the life of a patent when somebody will want it, if the demand for it comes slow at first.

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IMPROVED VERTICAL ENGINE.

This type of engine is one that is growing in favor in some sections as an agricultural engine for light work. It has advantages over the horizontal engines in several important particulars, one of which is its ease in being set in position to connect with grain separators for thrashing. Unlike the horizontal engine, it is not requisite that it be set perfectly level, and it can be much more easily placed in position ready for work. The engine is also motionless in running, as the truss-like shape of the mountings makes it so solid that there is no motion. This is an advantage that cannot be attained in a horizontal engine to the same extent.

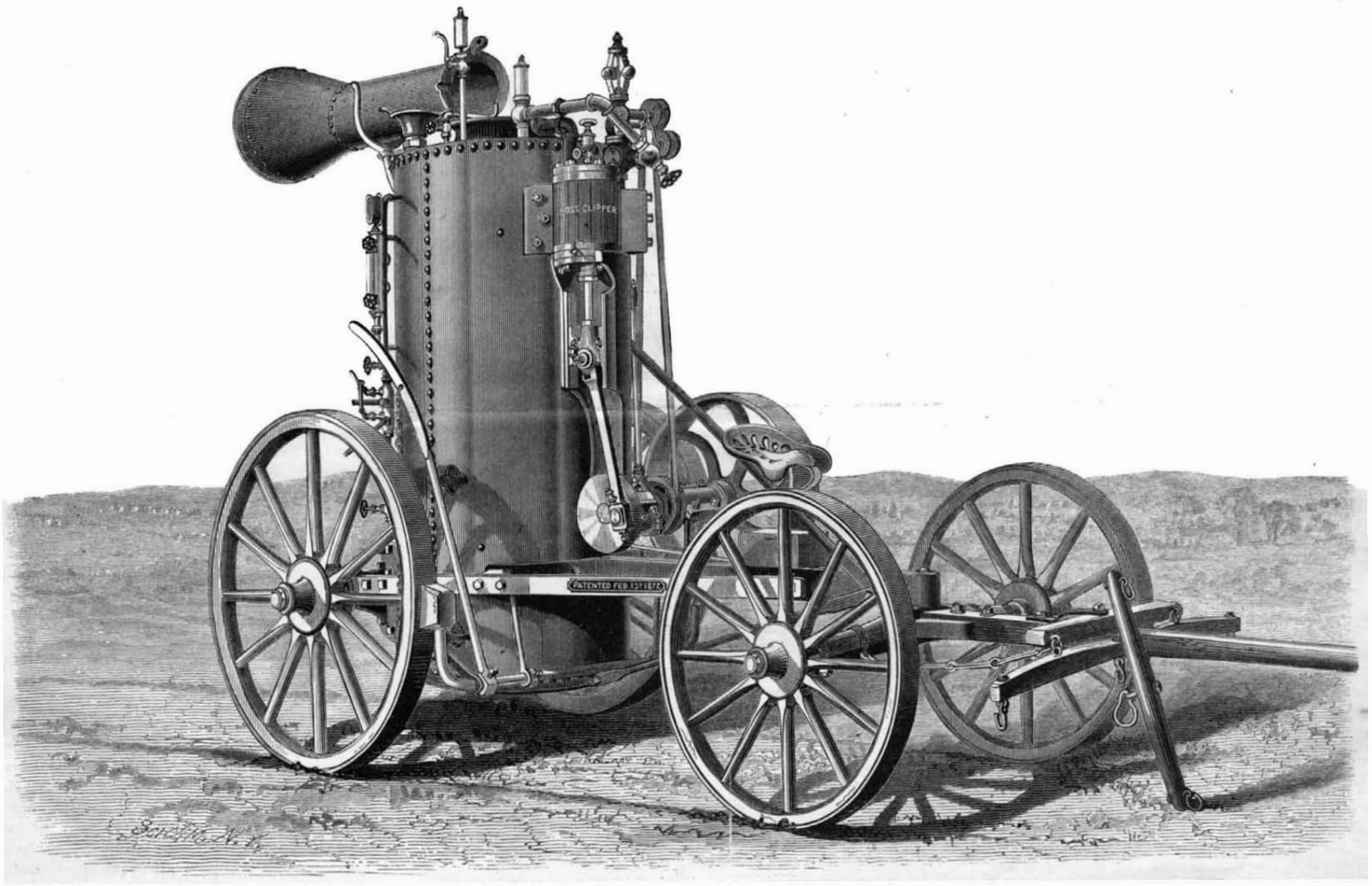
This style of engine can also be built with less weight for the same power than a horizontal. The engine is made with a dome on the top, arranged so that all of the flues and top flue head are kept covered with water, making a steam chamber that superheats the steam and tends to produce dry steam All the material used in the construction of this engine, with the exception of the door frame and grate bars, is of the best quality of charcoal boiler iron, with the best lap welded boiler flues. A large amount of heating surface is allowed for the cylinder used, so that the fire need not be forced. The boiler has a large number of flues, and a complete circulation, in consequence of which the amount of fuel per horse power developed is reduced to the very lowest point attainable with a slide valve engine.

It has been the aim of the builders to make an engine with as few parts as possible, and arrange it so that it could be more easily operated by persons inexperienced in the use of steam than the ordinary agricultural engine. It will be seen from the cut that the engine frame, guides, cylinder, and steam chest are cast in one solid piece in girder shape, giving the most strength with the least iron. This style of frame makes it impossible for the guides to get out of line with the cylinder, and avoids a complication of parts. The crosshead is made with adjustable gibs at the side, substantially held in their place by a bolt on each side of the crosshead; the crosshead is provided with a steel pin with taper ends, fitted so as to take up all lateral motion, and is fitted with a self-oiler that oils through the pin. The connecting rod is made of the best hammered steel, with solid ends fitted with phosphor-bronze boxes. The crank pin is made large, allowing plenty of surface and preventing the possibility of heating. The crank shaft is of steel, with a solid disk forced on shaft by hydraulic pressure to make a perfect and tight fit. The valve is the usual D-valve, proportioned on correct principles. Steam ports are large and distance to the cylinder short, insuring good results for a quick-acting engine. The cylinder is fitted with adjustable packing that requires no attention—a very desirable feature in an agricultural engine. The governor has a stop motion, speeder, and Sawyer's valve attachment, and is sensitive and very economical in the use of steam; if the belt breaks when under full headway, the governor shuts down and stops the engine. No pump or heater is used on this engine, but in their place the most improved steam feed is used, whereby the boiler is filled without running the engine. The boiler is fitted with a pop-safety valve, and also with a spring valve, which insures safety, and is also very useful in filling the boiler. A steam blower and steam whistle are furnished; also a steam flue cleaner, which will instantly clean the flues.

As will be seen from the engraving, the engine is extremely simple, all parts being within easy reach of the operator. The boiler has good clearance from the ground; the mountings are so constructed that they give great strength, and likewise permit of easily turning the engine. A substantial brake is furnished with each engine. A strong seat, tool box, double trees, neck yoke, and fire irons are also furnished. This engine is built as an agricultural engine in three sizes, 6, 8, and 10 horse power; it is built on a base as a 5, 6, 8, and 10 horse power. Wherever it has been introduced it has gained many friends.

This company also manufactures in horizontal engines the Dry Steam portable, Climax portable, and the Tiger portable, varying from 2 to 40 horse power—three distinct styles; their cut-off engines, class A and B, from 12 to 250 horse power; the Climax and Tiger stationary engines, and five sizes of patent sawmills.

Further particulars may be obtained by addressing the Taylor Manufacturing Company, Chambersburg, Pa.



THE "BOSS CLIPPER" VERTICAL ENGINE.—MADE BY THE TAYLOR MANUFACTURING COMPANY.

New Secondary Battery.

An important improvement in electrical apparatus, by Mr. George Grout, has recently been exhibited and explained by him before the students of the College of Practical Engineering at Muswell Hill, Eng. This improvement consists of a new secondary battery, presenting several features of superiority over those of Planté, Faure, and others. It is well known that in an ordinary galvanic battery the electricity is generated by the oxidation of a metal—generally zinc—whereas in a secondary battery the metal is in the state of an oxide to begin with, but is deoxidized by a current of electricity, usually obtained from a dynamo machine, and by the subsequent oxidation of this recovered metal nearly the whole of the electricity expended upon the deoxidation is reproduced. In Planté's battery the metal employed is lead, which is allowed slowly to oxidize by immersion in diluted acid, so as to form the organism of the battery. But in Faure's improvement upon this a coating of oxide of lead is laid upon the metal, by which a great saving is effected in the time necessary for the creation of the battery. In Mr. Grout's plan a central core of lead is introduced into each cell, and this core is surrounded by a layer of enveloping charcoal, among which finely divided lead has been disseminated so as to pervade every pore, and the immense area of the leaden film thus presented for oxidation facilitates the process and correspondingly increases the quantity of electricity generated. The metallized charcoal may, if desired, be moulded into plates like those of an ordinary galvanic battery, or it may be applied in other forms; the only material point, in all forms alike, being the great extension of the oxidizing surface. Mr. Grout showed in operation a secondary battery of 26 cells deoxidized by a dynamo machine of the Brush construction, and he explained to the students the identity of the principles which govern the production and action of electricity with those which underlie the whole fabric of engineering science. Several electric lights were shown of absolute steadiness and great brilliancy, and it was explained that there is nothing to prevent electricity from now being supplied, like gas, by meter, not merely for the production of light, but for the convenient and economical generation of power.

Solutions of Salicylic Acid.

As the result of an extensive series of experiments with solutions of one liquid in another, Alexeff has established the law that all liquids which perceptibly dissolve in each other will mix under certain circumstances in all proportions.

Alexeff has recently extended his experiments, as described in the *Journal fur practische Chemie*, to the solubility of solids at ordinary temperature. When experimenting with salicylic acid, he found that this acid would dissolve in water in all proportions, if heated in sealed tubes to a temperature a little above the boiling point of water. When these tubes cool, the acid sometimes separates as a crystalline magma, sometimes as an oily liquid. The former is the case with all solutions when rapidly cooled, and in solutions containing over 66 per cent of salicylic acid, even if cooled slowly to 153° Fah.; while those which contain 61 to 4·57 per cent yield an oily liquid at temperatures from 194° down to 145° Fah. This seems to prove that such solutions separate, as they cool, into two liquids; the upper one is salicylic acid dissolved in water floating upon the heavier and highly refractive solution of water in liquid salicylic acid.

Analyses of the solutions showed that water saturated at 54½° Fah. contained only 0·16 per cent of acid; at 151° it contained 1·27 per cent; at 179° it contained 2·44 per cent; and finally at 212° it contained 8·67 per cent of acid.

Hence there may exist at temperatures between 145° and 195° three different solutions, according to circumstances, namely: a solution of water in salicylic acid; a solution of the acid in water, from which the liquid acid separates on cooling; and finally a solution of salicylic acid in water, which deposits crystals on cooling.

The two last named may be called isomeric in so far as they have the same composition, but at one time deposit the liquid acid and at another the solid. It may also be assumed that all solutions made at temperatures below 212° contain the solid acid, while those prepared at higher temperatures contain the liquid.

Alexeff thinks that these observations prove the incorrectness of the idea that all substances are liquids when in solutions, and that their state of aggregation has no influence on the solubility.—*Erf.*

DURING the past three years ivory has risen at least 100 per cent in value, and pearl, which is also largely used in hafting cutlery and other goods, has advanced very materially in the same period.

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Self-operating Wire Rope Tramway.

A description has recently been given in the German technical press of a wire tramway in connection with the coal mining industry established near the Hersteigg, the products of which it brings to the main line belonging to the Southern Railroad of Austria. In its alternating rise and fall during its distance of 3,000 yards, there is a useful excess of incline of about 142 yards, which, it is said, suffices to keep the line in self-acting working, after it has been started by means of the twelve horse power engine provided for that purpose. When there is no return load to be sent to the mine, the speed of the line can be regulated by a brake. Under these circumstances, the cost of working the line is estimated at about 4½ cents per ton of coal.

In its general arrangement, the tramway forms a straight line, and consists of two drawing ropes and the train rope. The line which is used for conveying the coal to the station is 1·10 inches thick, and is composed of nineteen steel wires, each 0·18 of an inch in diameter. The line on which the coal buckets are returned to the mine is only 0·66 of an inch thick, the nineteen steel wires of which it is composed being only 0·13 of an inch thick. Both ropes consist of wires about 765 yards long, coupled to each other, and for the ropes a breaking strength of 73 tons per square inch section is guaranteed. At the ends of the ropes, weights of 5 and 3 tons are applied in the usual way for obtaining the proper tension. The distance between the seventeen supports varies from 60 to 400 yards. The train rope is 0·6 of an inch thick, and consists of twelve soft steel wires, of 0·07 of an inch diameter, and runs at a speed of about 1⅝ yards per second. The buckets which convey the coal follow each other at a distance of about 83 yards; thus thirty-six are always on the way to and the same number coming from the station. Each bucket contains about 10 bushels, or about a quarter of a ton of lignite, the total quantity carried per hour being about 17½ tons. The cost of the line was about $14,000.

Pile Driving by Dynamite.

In the course of executing some municipal works at Buda-Pesth, the piles already driven were required to stand a greater load than had been originally contemplated. It was, therefore, necessary to test them, and drive still deeper those that yielded. On account of the expense of bringing a pile driving machine successively over each pile for so little work, it was determined to try the effect of dynamite; and the city engineers applied to Colonel Prodanovic, of the Second Regiment of Austrian Engineers, to carry out the experiments.

According to the *Wochenschrift des Oesterreichischen Ingenieur und Architekten Vereins*, the piles were cut square, and a wrought iron plate, 15 inches in diameter and 4⅜ inches thick, was placed on the top of each. On its center, and immediately over that of the pile, was placed a charge of No. 2 dynamite, in the form of a cake, 6 inches in diameter and three-fourths inch thick, and weighing 17½ ounces avoirdupois. This was wrapped in parchment paper, covered with clay, and fired. The effect produced was found on an average to be equal to five blows from a 14¾ cwt. monkey falling from a height of 9 feet 10 inches. The iron plates stood from twenty to twenty-four explosions. The system is not considered applicable to a pile standing considerably out of the ground, but saves a great expense when piles already driven have to be sunk deeper. In this country gunpowder has been used for many years, particularly in Philadelphia, for pile driving, though employed generally to drive the monkey upward.

DR. THOMAS TAYLOR, of Washington, has made some investigations, which convince him that the common house-fly, aside from being an annoying pest, is possessed of the capacity of transmitting disease by carrying the germs from place to place.

IMPROVED RAILROAD CRANE.

In the powerful crane shown in our engraving the post is a dry sand casting in one piece. The bottom of the post and the deck plate upon which it stands are carefully faced up, making a fitted joint, and they are held together by the foundation bolts, which extend through the stone foundation to the anchor plates at the bottom.

A hub is fitted into the top of the post with a large pin, on which the jib turns, the jib being secured by rods to the yoke, which turns freely on the pin. The yoke also takes two vertical bolts, which go through the shoe casting at the bottom. In the shoe are two turned cast iron wheels, which track around a turned belt on the post, so that the jib turns very easily, having the friction only on the upper pin and the wheels.

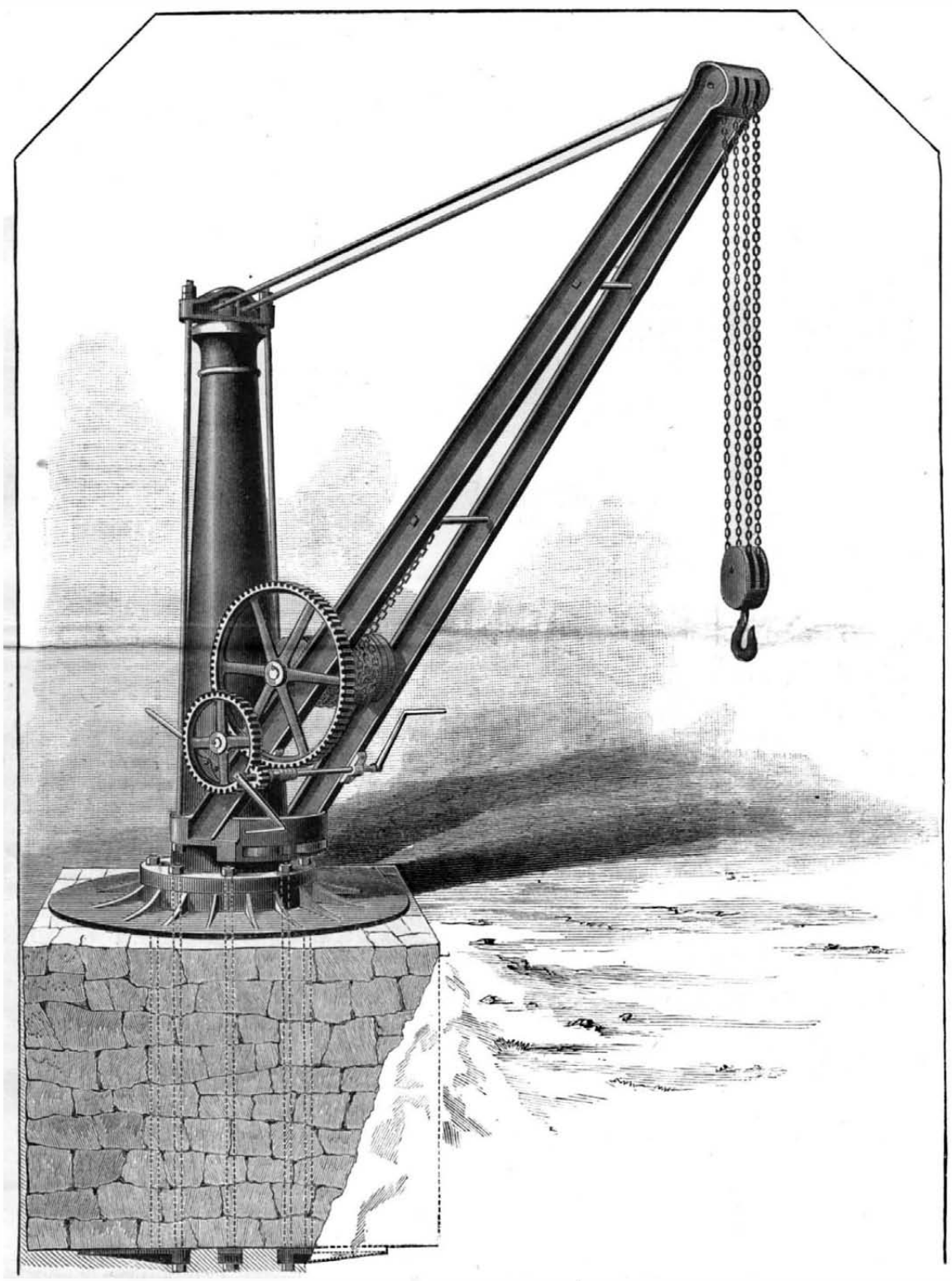
The jib consists of two wrought iron beams, which are bolted at the top and bottom to the bonnet and the shoe, and is provided with stay bolts between.

The gearing is double, with the pinion on the crank shaft, which works into either gear for fast or slow motion, or at half way between both blocks, or the pinion can be slipped out of both, so that the load can be lowered by the brake without causing the crank to turn.

The chain barrel is a hollow casting with spiral grooves around the outside, in which the chain follows. All of the moving parts are so simple that they cannot get out of order

BBB crane chain is used on all these cranes, and the sheaves in the bonnet have roller bushings, and require no oil. The crane is very simple, and may be used by any one; and wherever it is in use it gives perfect satisfaction. They are made in the following sizes, viz., 4, 6, 10, 15, and 20 tons capacity.

Further information may be obtained by addressing the Farrel Foundry and Machine Company, Ansonia, Conn.



RAILROAD CRANE MADE BY THE FARREL FOUNDRY AND MACHINE COMPANY.

AN excellent soap-bubble preparation is composed of oleate of soda and glycerine, and from it bubbles two feet in diameter and of exceeding brilliancy can be blown. Some of these have been kept forty-eight hours under glass.

Phosphoric Acid.

The author proposes a method for the direct determination of phosphoric acid from the weight of the phosphomolybdic precipitate. The following conditions must be observed in precipitation: The solution must contain a sufficiency of free nitric acid. The molybdic solution added must be four-fold the volume of the phosphoric solution to be precipitated, and at least one-third of the molybdic acid added must be in excess of the quantity required for combination with the phosphoric acid. In every 100 c. c. of the volume of liquid after the addition of the molybdic solution must be dissolved 25 grammes ammonium nitrate. The precipitate of ammonium molybdic is filtered after standing for twelve hours, and is washed with a 20 per cent solution of ammonium nitrate, to which at the beginning of the washing one-thirtieth of its bulk of nitric acid is added. After removal of the greater part of the ammonium nitrate by means of water the contents of the filter are rinsed into a porcelain crucible, the matter adhering to the paper is dissolved in hot dilute ammonia, the solution is concentrated by evaporation, an excess of nitric acid is added, the solution is poured into the porcelain crucible, the liquid is evaporated away, and the ammonium nitrate expelled by gently heating over a flame placed below a wire gauze. The volatilization of the ammonium nitrate is found to be complete when a cold watch-glass placed over the crucible is not clouded. The ammonium phosphomolybdate is not decomposed if a needlessly high temperature is avoided. The residue is hygroscopic, and must be cooled in the desiccator over sulphuric acid, and quickly weighed in a covered crucible. The residue is said to contain 3·794 per cent phosphoric acid. O. Hehner, in the *Analyst* (iv., p. 23), criticises this process, and proposes a modification. A. Atterberg has determined the conditions in which the most rapid and complete separation of the ammonium phosphomolybdate can be effected. He finds that by boiling the solution with molybdic acid solution the phosphoric acid is precipitated in a satisfactory manner. The boiling is effected in a beaker of moderate size, stirring continually to prevent bumping. The heat is obtained from a naked lamp flame beneath a wire gauze. The precipitate settles very quickly, and can be at once submitted to further treatment.—*R. Finkener.*

Perils of Ballooning.

Information has been received in this city of the frightful death of two over-daring aeronauts in Madrid under peculiarly horrible circumstances. It appears that Captain Mayet and an assistant ascended in a balloon in Madrid, before an immense concourse of people, on January 28. When the balloon had reached a height of about 1,000 feet, Captain Mayet got out upon a trapeze suspended from the basket and began his performances. The trapeze was seen to break, and the performer lost his hold. While in the air he turned over and over many times He struck the stone pavement an unrecognizable mass. A moment later the balloon containing the other occupant was seen to descend with meteoric rapidity, and it crashed with terrible force against the projecting eave of a house, tilting the basket and hurling the occupant out head first. Striking a veranda, the man was precipitated to the ground, torn, cut, and mangled to such a degree that he died in a few moments. Both the men were under engagement to Barnum, Bailey & Hutchinson, and were to perform in this city on March 26.

THE Canada-Atlantic Railway Company recently opened its line between Montreal and Ottawa for freight and passengers. An extension from Ottawa to Toronto is now in progress, and in less than a year will afford a competing line to the West. The company proposes to build a bridge across the St. Lawrence at Coteau Landing, so as to connect its line with railways to Boston and New York.

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Killing Cattle by Electricity.

In a recent issue of the *Zoophilist* Mr. Lane-Fox describes an easily constructed apparatus for putting an end to worn-out horses, asses, or even cattle used for food, by the electric discharge. An ordinary stall has an iron plate fastened upon its floor large enough for a horse or bullock to stand upon. With this plate is connected the negative pole of an electrical condenser, formed of alternate layers of tinfoil and tissue paper soaked in paraffine. This condenser is charged from an ordinary coil to its full capacity of a hundred "micro-farads," and is to be discharged at an electromotive force of 15,000 "volts," which produces a one inch spark. The animal to be dispatched has the top of its head and also its feet and legs wet with salt water. It is then led into the stall with its hoofs resting on the iron plate. The brass knob which makes the positive pole, and has an insulating handle, is then applied to the forehead of the animal, which falls down stone dead the moment the contact is effected.

The London *Telegraph*, alluding to the article in the *Zoophilist*, concludes that there can be no kind of death more free from pain as well as from the horrid circumstances now attending the slaughter of favorite animals when old age, accident, or disease has rendered it necessary to kill. Everybody knows how sadly often the pistol or the knife, now in use, produces lingering agonies, and how shocking it seems to commit an old servant to the brutal hands and clumsy methods of such as too generally undertake the duty. Here is a plan which will obviate all this unpleasant experience and give to many a faithful animal an easy euthanasia. It well deserves to be put into practice and to receive public encouragement. There may be objections perchance to such a mode of slaughtering animals intended for human food, because of the effects produced on the flesh by the electric current; but possibly before capital punishment is abolished death by judicial lightning after such a fashion may be adopted in place of the hideous violence of the long drop. Certainly as a project for killing worn-out quadrupeds it appears as effective as it is kindly.

How to Apply the Soda Remedy in Burns and Scalds.

It is now many years ago that the author, while engaged in some investigations as to the qualities and effects of the alkalies in inflammations of the skin, etc., was fortunate enough to discover that a saline lotion, or saturated solution of the bicarbonated soda in either plain water or camphorated water, if applied speedily, or as soon as possible, to a burned or scalded part, was most effectual in immediately relieving the acute burning pain; and when the burn was only superficial, or not severe, removing all pain in the course of a very short time; having also the very great advantage of cleanliness, and, if applied at once, of preventing the usual consequences—a painful blistering of the skin, separation of the epidermis, and, perhaps, more or less of suppuration.

For this purpose all that is necessary is to cut a piece of lint, or old soft rag, or even thick blotting paper, of a size sufficient to cover the burned or scalded parts, and to keep it constantly well wet with the sodaic lotion so as to prevent its drying. By this means it usually happens that all pain ceases in from a quarter to half an hour, or even in much less time. When the main part of a limb, such as the hand and forearm or the foot and leg, has been burned, it is best, when practicable, to plunge the part at once into a jug or pail, or other convenient vessel filled with the soda lotion, and keep it there until the pain subsides; or the limb may be swathed or encircled with a surgeon's cotton bandage previously soaked in the saturated solution, and kept constantly wet with it, the relief being usually immediate, provided the solution be saturated and cold. What is now usually sold as bicarbonate of soda is what I have commonly used and recommended, although this is well known to vary much in quality according to where it is manufactured; but it will be found to answer the purpose, although probably Howard's is most to be depended on, the common carbonate being too caustic. It is believed that a large proportion of medical practitioners are still unaware of the remarkable qualities of this easily applied remedy, which recommends itself for obvious reasons.—*F. Peppercorne, in Popular Science Monthly for March.*

Cleansing Wash Leather.

A German optical journal recommends washing soiled polishing leather in a weak solution of soda and warm water, then rubbing a good deal of soap in the leather and letting it soften for two hours. It is afterward thoroughly washed until perfectly clean, and rinsed in a weak solution of warm water, soda, and yellow soap. It must not be washed in clean water, or it will become so hard when dry that it cannot be used again. It is the small quantity of soap remaining in the leather which penetrates its smallest particles and makes the leather as soft as silk. After the rinsing it is wrung out in a coarse hand towel and dried quickly. It is then pulled in every direction and well brushed, after which it is softer and better than most wash leather when first bought.

If rough leather is used to finish highly polished surfaces, it will often be observed that the surface is scratched or injured. This is caused by particles of dust and even grains of hard rouge that were left in the leather. As soon as they are removed with a clean brush and rouge, a perfectly bright and beautiful finish can be obtained.

A Physical Paradox.

Dr. K. Stammer, of Koberwitz, calls attention to the fact that a given quantity of water may possess unlike weights, according to the volume it seems to occupy. If, for example, we pour three ounces of water into a four ounce beaker glass, balanced on a pair of scales, the water will be found to weigh just three ounces; if now we immerse any substance in the water that shall increase its volume so as to just fill the beaker, without touching the bottom or sides, the water will now weigh four ounces, or just as much as if the beaker had been filled up by pouring in one more ounce of water. The apparent anomaly consists in the fact that the increase of weight is the same whether the immersed substance weighs one-eighth of an ounce or eight ounces. An empty test tube pressed down in the liquid will produce the same increment of weight as would the same test tube full of water or of mercury. The difference consists in this, that the empty test tube must be pressed down with a considerable force; the tube full of mercury requires to be held up with considerable force to prevent its touching the bottom of the vessel.

Every one knows that a body immersed in water is buoyed up with a force equal to the weight of the water displaced, irrespective of the weight of the body. This loss of weight is, of course, communicated to the water, and its weight is increased by just so much, so that there is really less mystery about it than Dr. Stammer would have us think. It is like the ancient problem of why a pail of water weighs no more with a live fish in it than it does without the fish. The fact that a very light body can increase the weight of water more than it weighs itself, is due to the pressure that has to be applied to force it down into the water.

Clothes Moths.

There has always been confusion and uncertainty in referring to the correct names of the clothes moths found in this country, and we are glad to note the fact that Professor C. H. Fernald, in the *Canadian Entomologist* for September, 1882, pp. 166–169, has given us a concise account of our species, based upon a large collection brought together from all parts of the country and sent to Lord Walsingham for comparison with European species. It appears that we have no native clothes moths, the three species observed in this country being identical with European species. They are as follows: 1, *Tinea pellionella*, Linn., the case making and most destructive species; 2, *Tinea tapetzella*, L., the gallery making species, rare in this country; 3, *Tinea biselliella*, Hummel, which is also not a case making species. The intricate synonymy of the first and third species, which have been redescribed by American authors under several names, is given in full by Professor Fernald, who also describes the imagos and gives some biological notes on the species.

The Giant Sloth in Iowa.

Our readers will recall the suggestion of Professor Marsh that the man-like foot prints in the quarry of the Nevada State Prison might have been made by a giant sloth, though no other vestiges of the animal have been found in that region. Professor Marsh's suggestion gives special interest to a recent find of bones of this extinct animal, in a sand pit near Council Bluffs, Iowa.

The bluff formation along the Missouri River in western Iowa is composed of extremely fine silt cemented by lime. The bluffs, which are from 300 to 400 feet high, rest on the ordinary drift of the Iowa prairie, which overlies oolitic limestone. At intervals of two or three miles are pockets of pure sand from 200 to 400 feet deep. It was in opening one of these deposits that the bones were found in large quantities. It is said that no similar discovery has been made in that region. The skulls were in fairly good preservation, but the most of them were badly injured by the careless and ignorant workmen. The teeth, which are well preserved, are from three to four inches in length. The find has been taken in hand by a local scientific association, and careful explorations of the sand beds will be made.

Theory of Magnetism.*

In the year 1879,† I communicated to the Royal Society a paper "On an Induction Currents Balance and Experimental Researches made therewith." I continued my researches into the molecular construction of metallic bodies, and communicated the results then obtained in three separate papers‡ bearing upon molecular magnetism.

To investigate the molecular construction of magnets required again special forms of apparatus, and I have since been engaged upon these, and the researches which they have enabled me to follow.

From numerous researches I have gradually formed a theory of magnetism entirely based upon experimental results, and these have led me to the following conclusions:

1. That each molecule of a piece of iron, steel, or other magnetic metal is a separate and independent magnet, having its two poles and distribution of magnetic polarity exactly the same as its total evident magnetism when noticed upon a steel bar magnet.

2. That each molecule, or its polarity, can be rotated in either direction upon its axis by torsion, stress, or by physical forces such as magnetism and electricity.

3. That the inherent polarity or magnetism of each molecule is a constant quantity like gravity; that it can neither be augmented nor destroyed.

4. That when we have external neutrality, or no apparent magnetism, the molecules, or their polarities, arrange themselves so as to satisfy their mutual attraction by the shortest path, and thus form a complete closed circuit of attraction.

5. That when magnetism becomes evident, the molecules or their polarities have all rotated symmetrically in a given direction, producing a north pole if rotated in this direction, as regards the piece of steel, or a south pole if rotated in the opposite direction. Also, that in evident magnetism, we have still a symmetrical arrangement, but one whose circles of attraction are not completed except through an external armature joining both poles.

The experimental evidences of the above theory are extremely numerous, and appear so conclusive that I have ventured upon formulating the results in the above theory.

I hope in a few weeks to bring before the Royal Society the experimental evidence which has led me to the conclusions I have named; conclusions which have not been arrived at hastily, but from a long series of research upon the molecular construction of magnetism, now extending over several years.

* "Preliminary Note on a Theory of Magnetism based upon New Experimental Researches." By Prof. D. E. Hughes F.R.S.

† "Proc. Roy. Soc.," vol. xxix., p. 56. 1879.

‡ "Proc. Roy. Soc.," vol. xxxi., p 525; vol. xxxii. pp. 25, 213, 1881.

Archæological Discoveries in Mexico.

Important archæological discoveries have recently been made at Mitla, a village in Mexico, which is situated between twenty and thirty miles from Oajaca, in the tableland of Mixtecapan. Extensive remains of ancient palaces and tombs have been revealed, and it is stated that they are exceptionally remarkable from the columns supporting the roof, a style of architecture peculiar to the district of Mexico in which they have been found. These ruins have been explored and photographed by Herr Emil Herbruger, although he was not permitted to excavate the sites. In a description of the ruins, Herr Herbruger states that the great hall contains six columns, and is 37 meters long by seven broad. Each column is 3½ meters in height and is of solid stone. The hall, which is entered by three doorways, was used as an antechamber for the royal guards. The tombs are all of equal size and T-shaped. The walls are embellished with stone mosaics. The vault floor is one meter below the surface, and at the entrance stands a monolith column. The tombs extend in order from the column, each being five meters long by one and a half broad; there are also several columns, each two meters high and one and a half in diameter. For some time Herr Herbruger and his Indian attendants used the tombs as sleeping apartments, but subsequently the Indians refused to sleep in the tombs, on the ground that they were haunted. The explorer intends to publish a work descriptive of these discoveries, with photographic illustrations.

American Institute of Mining Engineers.

At the Boston meeting, February 23, the secretary submitted a report showing that the finances of the Institute were in a flourishing condition, and that its membership had been increased 1,213. The election of officers was announced as follows: President, Robert W. Hunt, Troy, N. Y.; Vice-Presidents, S. F. Emmons, Denver, Col.; W. C. Kerr, Washington, D. C.; S. F. Wellman, Cleveland, O.; Managers, John Birkinbine, Philadelphia, Pa.; Stuart M. Buck, Coalburg, West Va.; E. S. Moffatt, Scranton, Pa.; Treasurer, Theodore D. Rand, Philadelphia, Pa.; Secretary, Thomas M. Drown, Easton, Pa.

A party of about sixty members of the Institute went to Lowell, where they were received by Mr. J. B. Francis, by whose invitation the visit was made. Mr. Francis, the foremost of living American hydraulic engineers, planned the present elaborate system of utilizing the water power at Lowell, and is conspicuously identified with similar work in other sections of the country. The Lawrence, Lowell carpet, and Merrimac mills, together with the water power, dam, and canals, were in turn visited.

Indelible Chalk Drawings.

The Swiss *Gewerbeblatt* recommends the following method of fixing chalk drawings:

Good black paper is coated with resin in the following manner: Common resin (colophonium) and shellac are dissolved in strong alcohol, and the solution applied to the black paper with a broad brush a number of times, each coating being allowed to dry perfectly before another is applied. The paper becomes matte and dull, but acquires a gloss when warmed.

Chalk drawings made on this paper can be made permanent by covering it with another sheet of well-sized paper over the face of the drawing and passing a hot smoothing iron over it. The extra sheet is carefully removed when cool, and the drawing can then be rolled up without any injury.

Effervescing Lemonade Sugar.

The manufacture of effervescing lemonade sugar is said to be as follows: Five parts of powdered sugar are treated with an ethereal oil, and mixed with one part of bicarbonate of soda. This mixture is filled into candy moulds, and pressed by means of a stamp. Within the mould a cavity is produced in the mass by the pressure, and into this there is poured one part of citric acid, which is pressed down, and then a fresh layer of aromatic sugar is added and pressed, after which the candy is finished.

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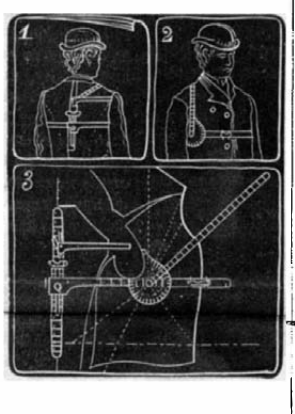
RECENT INVENTIONS.

Improved Pulley.

The engraving represents an improved pulley recently patented by Mr. John J. Irvine, of Chattanooga, Tenn. This pulley is provided with a removable section of the rim, which is designed to be taken out at any time for slackening the belt to facilitate the lacing of it when it becomes slack, taking off and putting on the belt when required. A segment of the rim of about a quarter of the circumference is made separately from the rest and fitted to be connected by flanges, bolts, and a key or nuts. In this case the removable section extend along the arm and its branches, the branched arm bein ; constructed separately to facilitate handling, and the arm is jointed to swing around sidewise to allow greater slack to the belt. It will be readily seen that by the slack that will be afforded to the belt by the removal of the section, the belt may be readily drawn together for lacing the ends without the use of clamps. The belt can also be put on and taken off without unlacing it, and may be readily slackened at any time for any purpose. In smaller sizes of pulleys the inventor proposes to cast the removable or adjustable portion of the arm and its branches, when used together, with the removable section, and connect it with the fixed part.

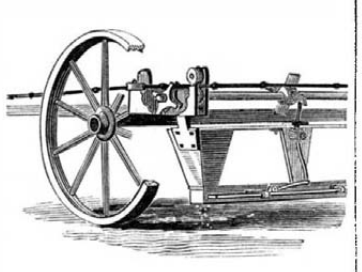
Apparatus for Measuring and Cutting Out Garments.

This is a scientific instrument for the use of tailors and cutters, by which the measure can be taken for the body of a coat or similar garments and readily transferred to paper, without requiring calculations or divisions of any kind, as is usual with most systems now in use. The invention consists in a mechanical instrument which is first placed to find a center, and the different measurements from the center are then taken, so that by afterward applying the instrument upon a sheet of paper, the pattern can be readily marked out, so as to insure a perfect fit upon regular or irregular forms. Figs. 1 and 2 show the application and Fig 3 represents the apparatus in detail as applied to the paper or cloth. This instrument takes the measure on true geometric principles, and the inventor claims that this is the first instrument for the purpose in which these principles have been scientifically applied. Mr. William Abrahart, cor. Woodburn Ave. and Madison Pike, East Walnut Hills, Cincinnati, O., is the patentee of this invention.



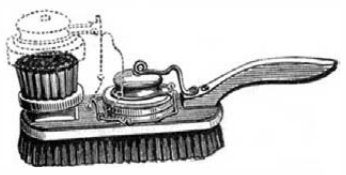
Check Row Corn Planter.

This is a dropping attachment to be applied to any form of check row planting machine, but more especially intended for the class of planters patented by the same inventor July 19, 1881. This attachment will not offer so much resi-tance to the knotted wire or rope staked across the field as those in common use, and will therefore be more durable and more efficient. The attachment is provided with a shaft having at the ends sprocket wheels, for engaging the knotted wire rope, as shown in the cut. The rope is properly guided, so as to insure its engagement with the wheels. At the middle of the shaft there is a cam provided with oppositely inclined blades which reciprocate the dropping plate below the seed boxes. This attachment is easily applied, and will do accurate work. Mr. John K. Voorbees, of Pilla, Iowa, is the patentee of this invention.



Blacking Attachment for Shoe Brushes.

The engraving shows a neat and convenient device for holding an ordinary box of blacking on the back of a shoe brush, so that the blacking and brush will always be found together. The attachment is made by means of links or hinges of wire, which carry at the outer extremity a ring in which is inserted a screw that enters the bottom of the blacking box and holds it rigidly. The handle and the box may be revolved, and the box may be fastened down against the back of the brush by means of the latch attached to the handle, or it may be raised up to apply the blacking to the dauber, as shown in dotted lines. The old box of blacking is readily replaced by a new one. This novel device is very compact, convenient, and cleanly, avoiding the necessity of handling the blacking box. It is inexpensive, readily made, and easily applied. Further information in regard to the invention may be obtained by addressing Mr. E. L. Wood, Eastland, Texas.



Society of Arts Prizes.

The Council of the Society of Arts, London, offers a prize of five guineas for a wooden plant label, saturated with paraffine or some other preparation which would preserve the label, and would be likely to keep the writing upon it legible either with or without the aid of paint, for five years.

They also offer an additional prize of five guineas for the best permanent border label suitable for private gardens, the cost of which should not exceed 4*l.* per thousand.

Specimens bearing a number or motto, and accompanied by a sealed envelope containing the name of the sender, must be sent to the Secretary of the Society, John Street, Adelphi, London, not later than June 1, 1883.

The specimens will be tested, and no award will be made if, in the opinion of the judges, no specimen is deserving.

The Society of Arts also offer the following prizes: A Society gold medal, or 20*l.*, for the best plan for "obviating or diminishing risk to life in the operations of coal mining." A Society gold medal, or 20*l.*, for the best plan for "obviating or diminishing risk to life in the manufacture, storage, and transport of explosives." A prize of 100*l.* for the best essay on "The Utilization of Electricity for Motive Power." Preference is to be given to that essay which, besides setting forth the theory of the subject, contains records with detailed results of actual working of experiment. A Society gold medal, or 20*l.*, for the best invention having for its object the prevention or extinction of fires in theaters or other places of public amusement.

Designs, plans, models, essays, descriptions, inventions, etc., intended to compete for any of the above prizes must be sent to the Secretary on or before October 31, 1883, and the Council may withhold the prizes or award others of less value if they see fit. Any one wishing to compete for any of these prizes can ascertain the exact conditions. The address of the Society is John Street, Adelphi, London.

Animals and Men Who Never See Daylight.

According to the Philadelphia *Record*, seventeen hundred mules employed by the Philadelphia and Reading Coal and Iron Company in connection with mining operations toil under ground daily. At many of the mines the mules do not see the light of day for a year at a time, and very often a mule spends ten years of his life under ground. The effect of daylight upon mules that have been so long in darkness is blinding. In many instances this blindness is permanent, the shock of sudden light being too great for the eyes; but it is the general rule that the mule staggers around in blindness for a few days, always, however, finding his way to the feeding bin, and taking true aim with his heels. At the end of the week eyesight returns, he brays with all the vigor of lung for which his kind is celebrated, elevating his tail as an accompaniment.

There are, in round numbers 2,300 of these animals employed in all capacities by the Reading Coal and Iron and Railroad Companies. Many of them are taken up and down on the cage at the mines daily. An officer of the company said yesterday that, in an economic point of view, they are thirty-three per cent cheaper than horses, but that this is offset by the risk run in employing these animals. No wagon boy has been thoroughly initiated until he has felt the weight of a mule's heel.

In the mining region, where disputes of almost all kinds are settled by fisticuffs, the mule plays an important part in the miner's training for battle. He approaches the mule, which seems to be sleeping, and gives him a fews taps on the rump with his bare knuckles as a reminder that he is wanted to take part in a sparring match. The mule responds, the blows are parried, and the sturdy miner gets in one or two from the shoulder which knock the animal out of time, the latter retiring with backed ears and looking deeply humiliated. A number of gentlemen in this city, prominently identified with the anthracite coal trade, who have been practical miners, relate this as an actual fact.

Plant Labels.

In transplanting spring shoots, as well as in sowing seeds, the gardener often feels the need of a convenient label, that will withstand the rain and not get soiled with the mud. A writer in the German *Diamond* recommends the use of glass tubes, in which the paper labels can be slipped and the tube corked or sealed. The tubes should be eight inches long, and have an interior diameter of half an inch, and be made of quite thick glass. For house plants and conservatories, elegant labels can be made from wider and shorter tubes, open at both ends, one being closed with a cork, from which the label is suspended by a thread or wire passed through the cork, the other end being used to hang the tube on a branch of the tree or shrub.

International Electric Exhibition, Vienna, 1883.

The extent of the Vienna Electric Exhibition may be estimated by the fact that the motive power to be actuated has been fixed in round numbers at 1,000 horses. About 700 of them are calculated to serve for lighting the exhibition buildings and grounds.

Economical Gas Generators and Engines.

The power for the new gas engine works of Messrs. Crossley Bros., Limited, is to be obtained from gas engines driven with generator gas made by the Dowson process. Nearly all the plant for 150 horse power has been put down, consisting of three producers connected with three scrubbers for washing the gas, and a holder for compensating the supply and regulating the pressure. Messrs. Crossley have had a 30 horse power engine working regularly with this gas during about two months, under test conditions. It has been found that the generators took 45 minutes in firing up, and afterward the fuel consumption per 1,000 cubic feet of gas passed into the holder was 13 2 pounds. The *Journal of Gas Lighting* says that the gas consumption of the engine was at the rate of 109 cubic feet per indicated horse power per hour, representing a fuel consumption of 1·4 pounds per horse power per hour. The coal used is small sized anthracite, costing 3s. 6d per ton in truck at the pit. The wages for the fireman for the gas generators are about the same as for a set of steam boilers. Thus the economy of the system consists chiefly in the low rate of fuel consumption. This consideration is important, in connection with the fact that the engines are small; for it will enable different lines of shafting to be driven by separate engines as economically with regard to fuel as by a single large engine of the best construction. Any department may therefore be kept at work independently of others. Against this advantage must be set off, in the case of manufacturers who have to purchase their gas engines, the high price of these machines and the added cost of the gas producing plant.

How Long it Takes to Smell.

Various delicate experiments have been made in order to determine the so-called "reaction time" in sensation—*i. e.*, the time between the moment of excitation of the sense and the moment at which the person indicates by a signal that he has become conscious of the sensation. M. Beaunis, of Nancy, has recently sought to measure the reaction time for smell. He gives (*Comptes Rendus*) a table of the numbers obtained with ten substances; they range from 37 hundredths of a second for ammonia, and 46 for acetic acid, to 63 for mint, and 67 for carbolic acid. In the case of musk, he was unable (notwithstanding repeated attempts) to fix precisely the moment of the smell sensation. The numbers given show that the reaction time for smell is longer than that for touch, sight, and hearing. (In the author's own case, it is shorter than for touch.) Dr. Buccola, of Turin, has recently made experiments on smell, with different apparatus, and gets results which agree in the main with those of M. Beaunis.

Effects of Electricity upon the Nerves and Heart.

Among the curious exhibits at Munich Electrical Exhibition were a series of photographs representing the various changes and contortions produced in the human face by subjecting the different facial nerves of a patient to the action of electricity. These were the experimental photographs made by Professor Von Ziemssen. The expressions of joy, pain, surprise, doubt, disgust, etc., were easily realized, according to the nerve that was touched by the electrode.

Other observations and experiments by Professor Von Ziemssen promise to be of great importance. They institute a comparison between the continuous and the induced current in the stimulation of the important accelerator and depressor nerves which control the heart. He has found that an induced current, so far from stimulating the nerves of the heart, as heretofore believed, is perfectly inoperative, whereas a continuous current from an ordinary battery is of the very greatest activity.

Telegraphy in Europe.

Lecturing on the progress of telegraphy before the Institution of Civil Engineers, Mr. Preece stated that in the British system the three forms of battery used are the Daniell, Leclanche, and bichromate in the proportions respectively, of 87, 56, and 21. If these figures are read as thousands, they represent nearly the actual number of cells of each kind in use. Magneto-electricity is applied for some forms of apparatus, and dynamos are occasionally utilized to supplement batteries. Of A B C instruments there are 4,398; needles, 3,791; Morse printers, 1,330; and 2,000 sounders, an instrument which is gaining ground rapidly in England. Sound reading is almost exclusively adopted in America, but is rarely used on the Continent, although it is the most rapid and accurate. There are 224 Wheatstone's automatic instruments in use, and in England 319 duplex and 13 quadruplex circuits are at work.

Electrical Light of Comets.

According to Huggins, comets emit a characteristic light which indicates, by spectral analysis, the presence of carbon, hydrogen, and nitrogen, elements which are shown by the spectra of acetylene and cyanhydric acid. Berthelot thinks that these results point to an electric origin of the light. He has shown that acetylene is formed immediately and necessarily, whenever carbon and hydrogen come under the influence of the electric arc. When nitrogen is added to acetylene, the electric influence produces cyanhydric acid. It seems scarcely possible to conceive of a continuous combustion in cometary matter, but an electric illumination may be easily understood.—*Ann. de Chim. et de Phys.*

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MECHANICAL INVENTIONS.

A novel spring hinge joint fastening for pocket books has been patented by Mr. John Menahan, of New York city, which consists in a spring hinge joint fastening with a plate provided with an elastic bent hinge bar, whereby the fastening can be readily opened and closed.

A novel hoof trimmer has been patented by Mr. William M. Cleeland, of McCauleyville, Minn. The implement consists of a device for trimming the edges of animal hoofs even with the edges of the shoes. The lever device supporting the trimmer knife is provided with a gauge to regulate the amount required to be cut off.

A new and simple brake lever has been patented by Mr. William Moore, of Clear Spring, Ind. The invention consists in an improved brake lever for use with wagon brakes, the object being to secure great power when the brake is applied, and a greater extent of movement of the brake shoes when released from the wheel than heretofore.

An improved ventilating screen for windows has been patented by Mrs. Sarah B. Stearns, of Duluth, Minn. The object of the invention is to secure a thorough ventilation of schoolrooms and other rooms without exposing the occupants of the rooms to currents of air. A screen is provided and attached to the casing of the window, and operated by a cord and pulley similar to an awning.

A novel piston packing device has been patented by Mr. Delbert W. Jewell, of Alexander, N. Y. The invention consists in packing segments fitted to slide radially of the piston head, and in cams carried by a sleeve on the piston rod for forcing the segments outward, whereby the adjustment of the packings is accomplished from the outside and without removing either head of the cylinder.

An improved saw table gauge has been patented by Mr. Daniel K. Barnhart, of Gaines, Pa. The invention consists of a saw gauge for setting lumber to a sawing machine and gauging it to measure, the setting gauge having a scale combined and arranged with it, by which to indicate the distance necessary to shift the gauge for setting it to cut strips of any required width, also having a dividing plate and stop device for setting the gauge to special sizes.

A combined hat and coat hanger and button hook, so contrived that it may be conveniently carried in the pocket, has been patented by Mr. William R. Cole, of Pottsville, Pa. The invention consists in a spring hook adapted to hold a hat, of a hook for holding one or more coats, and also adapted to be used as a button hook, and of a hook for suspending the device, the whole being arranged to be readily folded for putting away when not in use.

An improved holder for mower and reaper knives, which is of a very simple and inexpensive construction, has been patented by Mr. Jonathan R. Hamilton, of Kingston, Mo. The invention consists in a frame for holding the cutter bars of reapers and mowers while being ground. The cutter bars are held fixed at a certain inclination to the stone, yet permitting the cutter bars to be slid lengthwise, so as to bring their knives successively in contact with the grindstone.

An improved car wheel chill has been patented by Mr. William Wilmington, of Toledo, O. The invention consists in a car wheel chill having in its flange face a peripheral receptacle for sand or other non-conducting material, an annular opening communicating therewith, and an annular reservoir of greater capacity than the opening, which serves to convey away the gases generated in the receptacle. By this arrangement the cost of the chill is lessened, the removal of the accumulations in the annular opening facilitated, and the pressure of gases in the receptacle relieved.

An improved valve for pumps has been patented by Mr. James E. Sinclair, of Baltimore, Md. The invention consists of an elastic valve, preferably of hemispherical form, having a round orifice of comparatively small diameter, which is adapted to be dilated in size by the pressure of fluid against the concave surface and contracted by pressure against the convex surface of the valve. Combined with such a valve a metallic hemisphere formed in sections is secured to the outer surface of the valve in such manner that they shall fit close together edge to edge, and brace each other under pressure.

An invention designed to prevent the freezing up of hydrants has been patented by Mr. William H. Fromm, of Elizabethport, N. J. The hydrant is constructed with an elbow coupling divided into two unequal compartments by partitions, and provided with two valve openings and an outlet opening, the two valves having gear wheels and left and right screw threads upon their stems. The intermediate gear wheel has a hand wheel attached to its shaft, whereby by the same movement that closes the inlet valve another valve will be opened to discharge the water left in the hydrant.

A new millstone driver has been patented by Mr. Amos Callahan, of Maryville, Tenn. The invention, which is an improvement on a patent granted to the same inventor February 14, 1882, No. 253,681, consists in a millstone driver formed of two semicircular or like sections, having cushions interposed between the ends, and provided with arms and with undercut jaws, and transverse grooves or recesses in the upper and lower surfaces, combined with a top and bottom plate provided with lugs fitting under the undercut jaws, and with lugs fitting in the transverse grooves or recesses in the sections, whereby all the parts will be held together without the use of bolts or screws, and the construction of the driver materially simplified.

A hydropneumatic engine of novel device has been patented by Mr. Levi G. Cook, of Mapleville, R. I. This invention relates to the application of air and water combined for the production of a motive power; and it consists in a novel method of utilizing atmospheric air under pressure and subject to its percolation or passage up through a column of water which acts on a series of submerged wheels, from the shafts of which the power is obtained, and which may be transferred as required. The air after having been once used passes out through the top of the column and into the blower, whence it is forced into the air chamber, and thence in the bottom of the water column, and so may be used over and over again.

A device for utilizing the force of currents and streams adapted for use in driving centrifugal or reciprocating pumps to raise water for irrigating or mining purposes, and for various other objects, has been patented by Mr. Franklin M. St. Clair, of Silver City, Idaho. The invention consists of anchoring or otherwise making fast in a swift running stream two scows fastened at suitable distances apart by crossbeams. Between these two scows an ordinary undershot wheel is placed, its shaft resting on either scow. From the shaft the power is transferred to wherever wanted, by the use of the ordinary rack and pinion gearing, or belts and pulleys, as may be desired. The more rapid the current of the stream, the greater the power delivered. To the prows of the scows adjustable gates are provided for directing the flow of the water to the wheel. For grinding, dredging, or sawing lumber the inventor claims his invention to be specially adapted.

Mr. William M. Elrod, of Marshall, Mo., has patented a camera box of improved form, the object of which is to provide a camera box for taking successively a number of pictures without exposing the plates to the light except when taking the picture. A camera box is constructed with a hinged section containing a mirror or reflector for adjusting the camera without exposing the plates to the action of the light. These plates are contained in a sliding box below the hinged section, and are raised successively for exposure by means of a plunger contained in a tube attached to and projecting from the bottom of the camera box. This plate holding box is inserted in the camera box and can be moved forward, as may be necessary, by means of a gauged handle rod projecting from the rear or front end of the camera box. The plate holding box contains a ground glass plate, which is raised when the camera is to be adjusted.

AGRICULTURAL INVENTIONS.

A new harvester reel, the object of which is to give a horizontal raking movement to the beaters, whereby the grain shall be held back over the table while being severed by the sickle, has been patented by Mr. Sylvan B. Robbins, of Lawrenceburg, Ind. The invention consists in providing a reel having sliding bars for the beaters and a stationary cam, with which the bars are adapted to engage to give a definite movement to the beaters. The same inventor has patented an improved grain binder for harvesters, which consists of an oscillating needle combined with certain rotary and oscillatory devices operated by a rack bar which is connected to the elbow lever carrying the needle, whereby the cord is held, tied, and cut in binding the gavel, all being accomplished by one operation in a very simple manner. The same inventor has also obtained a patent for an improved cutter bar for harvesters. The invention is designed to cause the cutting operation to be performed with facility and the least strain on the cutters, and at the same time to reduce the power required to operate the latter. By this new cutter bar a joint shear and sickle cut enables the cutters to act upon the grain or grass to the greatest advantage, and protects the cutters from possible contact with substances liable to notch the edges and cause the premature dulling of the cutters. The same inventor has further patented an improved harvester rake. The special advantages of the invention are to obtain a powerful action of the rake as it is raised and lowered, while at the same time it is held firmly against the grain being raked or formed into a bundle upon the gavel platform. Taken altogether, Mr. Robbins has added to harvesting machinery some very desirable improvements.

MISCELLANEOUS INVENTIONS.

An improved whisk broom holder has been patented by Mr. Rudolph Skoog, of New York city, the object of which is to provide receptacles for whisk brooms and brushes, so constructed that the brooms and brushes can be readily put in and taken out.

An improved label and ticket receptacle has been patented by Mr. Samuel M. Holton, of Battle Creek, Mich., the object of which is to provide a receptacle for labels, tags, tickets, etc., and so securing them in the tills as to render it impossible to get the labels mixed, and at the same time enables a person to remove them one by one with facility.

A soldering lamp, the object of which is to furnish a lamp for jewelers, dentists, and others in the work of soldering has been patented by Mr. Charles W. Hoehn, of Bloomington, Ill. The invention consists in a laterally adjustable wick tube, by which the flame is brought to any desired point to insure an accurate regulation of the flame, for intricate work.

Mr. Patrick G. Clancy, of Lexington, Miss., has patented a side bar wagon, which consists in the construction and arrangement of curved side bars in relation to the body of the carriage and the springs, whereby great strength and elasticity are obtained for these parts, and the backward and forward pitching of the body is avoided.

A new method for preparing oxyquinoline has been patented by Mr. Otto Fischer, of Munich, Bavaria, Germany. It consists in a peculiar method of treating quinoline—sulphuric acid with caustic soda or potash under the action of heat. The oxyquinoline thus obtained and its salts are new antiseptics, and designed in many cases to take the place of salicylic acid.

A novel riding saddle has been patented by Mr. James A. Wynne, of Poore's Mills, Ga. The invention consists of a saddle provided with a top and a bottom seat. The top seat is supported upon the lower seat, four springs being interposed; thus the motion of the horse is counteracted, and less fatigue is experienced by both horse and rider.

An improvement in fishing rods has been patented by Mr. William Mitchell, of New York city, which consists of a butt or handle into which is inserted the rod itself, the interior of the handle being enough larger than the rod to admit of plenty of play, so that the strain and spring of the rod will be uniform throughout its entire length.

A boot and shoe stretcher possessing several improved features over the ordinary stretcher has recently been patented by Mr. Horace Glines, of West Stratford, Conn. The stretcher is not only adapted for stretching all the parts of a boot and shoe which the ordinary stretching implement is intended to do, but it is especially adapted for stretching the instep part of the boot in a more effective manner.

An improved cart spring has been patented by Mr. Gustav Walter, of Sandwich, Ill. The invention relates to an improvement in vehicle springs of the class known as village cart. The improved springs have their forward ends extending downward and connected to a transverse spring secured to a crossbar of the shafts, which provides an easy riding seat of ornamental appearance.

An improved button has been patented by Mr. Julius Weis, of Chicago, Ill. The invention consists in a button having a wire ring formed on its shank provided with two overlapping tongues, one of which has the end turned upward, the other downward, pressing upon the lower tongue. The button is secured to a garment by passing one tongue into the button hole and then turning the button.

An improved lamp wick to be used in burning heavy oils has been patented by Mr. Ives Lynd, of Troy, N. Y. The invention consists in a woven lamp wick having selvaged or firm edges and a nap rising on one or both sides from the warp, whereby the flow of the oil is facilitated, and the wick tube prevented from clogging, crusting, or receiving the flame downwardly.

A new and improved cider mill has recently been patented by Mr. J. L. Wilcox, of Flint, Mich., which consists in an endless bag and roller presses for conveying the pomace from the mill between the pressing rolls. A bag of canvas is filled with pomace from the hopper of a grinding mill and then is passed between a series of rollers, a place being provided for receiving the juice.

Mr. Lewis H. Rhoades, of Bay Center, Washington Ter., has obtained a patent for an improved anchor. The invention consists of dividing the flukes and connecting them to the shanks by two arms, each of the said shanks being bent at right angles, or thereabout, at the upper ends. A single cable ring is located midway between the arms. The anchor, it is claimed, will have greater holding power and will not be liable to foul.

A novel covering for door steps has been patented by Mr. Stephen Barnwell Trescot, of Pendleton, S. C. The invention consists in a step covering bolted to jointed braces in such a way that when the covering is not required for use it may be folded and easily removed. The bolts fit into sockets in the steps prepared to receive them, and which serve thus to keep the covering from becoming displaced.

An improvement in flannel or outer shirts for bicyclers, lawn tennis, etc., has been patented by Messrs. Howard Lynch, of New York city, and Frank L. Sheldon, of Rahway, N. J. The invention consists in a shirt front constructed with a series of cord loops passed through eyelet holes in the outer part of the shirt front and interlocked with each other, which allows the shirt front to be very quickly closed and opened.

An improved combined tub stand and clothes rack has been patented by Mr. James S. Duncan, of Browning, Mo. This invention consists in a novel arrangement of two frames pivoted at their inner ends to each other and to standards, and provided at their outer ends with legs or supports, these frames forming, when lowered, a stand for tubs and like articles, and when raised it serves as a rack for hanging clothes, etc.

An improved milk temperer for churns has been patented by Mr. William H. Swinford, of Cherokee, Ala. The object of this invention is to control the temperature of the milk while churning. A circular metallic water tight vessel, which may be filled with ice, or hot water, or chemicals, as desired, for regulating the temperature of the milk, and through which a sleeve is provided for the handle of the dasher rod to operate.

An improvement relating to tubular lanterns has been patented by Mr. David Curtin, of Jamestown, Dak. The object of this invention is to secure the guard rings which surround the globe to the upright pieces in such a manner that they will not be readily detached and lost, which often happens in the ordinary hand lantern. The guard rings may be slid up and down on the upright pieces, so as to readily allow the removal or replacing of the chimney globe.

Messrs. Charles Falkenberg and Jacob Lederer, of New York city, have patented an improvement in shirts, which has for its object to strengthen the yoke and make the shirt stronger and more durable under the arms and on the shoulders, where the coat chafes the shirt. This is accomplished by re-enforcing or backing the sleeves, from the shoulder seam toward the elbow, with an additional thickness of the same material of which the shirt is made.

An improved gusset for wearing apparel which is stronger and more durable, and which can be made more cheaply, than those at present in use has been patented by Mr. Charles Owen Reed, of Chicago, Ill. The invention consists in a gusset formed of a strip of material made in the shape of a lengthened and pointed ellipse, and in the method of attaching the gusset to the material, and sewing on the gusset at the same time while forming the hem and by the same stitches.

A novel slate frame has been patented by Mr. Robert F. Walsh, of Brooklyn, N. Y. The invention consists in a slate frame furnished at the upper end with a slot in which is pivoted a rotatable polygon designed to bear a copy in penmanship or the name of the owner of the slate. At the other end is provided a recess for receiving the copies and protecting them from injury. In one of the side bars of the frame is formed a pencil receiving groove provided with a sliding cover, while on the other side bar is formed a slot for receiving a knife for sharpening pencils.

An improved heating furnace has been patented by Mr. David W. Robb, of Amherst, Nova Scotia, the object of which is to provide a sufficient quantity of air to the fuel, and to prevent a hinderance of the draught by the formation of clinkers, which consists in a lining for a firepot formed of a series of sections provided with ribs which are curved inward. These sections are hung by hooks on internal flanges of the firepot. Flanged wheels which run on rails below the grate enable the grate to be drawn forward for the purpose of removing the clinkers.

An improved machine for mixing and working oleomargarine has been patented by Mr. Joseph H. McDonald, of New York city. A hollow vertical cylinder contains a central vertical shaft resting in a foot step in the bottom of the cylinder. A bracket is attached to and overhangs the top of the cylinder and supports the shaft. Upon the shaft adjustable blades are attached which stir the oleomargarine material. The machine is operated on the same plan as a pug mill. The peculiarly twisted propeller-shaped blades are not only effective in stirring, but force the material into discharging arms located at the bottom of cylinders.

An improvement in window screens has been patented by Mr. Richard J. Parrett, of Portland, Ind. The object of this invention is to provide a screen so attached to the window sash, that when the window is raised the screen covers the opening, and when closed the screen is automatically wound around a spring roller at the bottom of the window, so that the view from the room is not obstructed. The upper sash opening may be protected in the same manner by placing the spring roller at the top of the window and attaching the screen fabric to the upper sash.

An improved kiln head guide, the object of which is to facilitate the setting of the green bricks in preparing brick kilns, and also to promote accuracy in forming the heads of the kilns, has been patented by Mr. Charles F. Lacour, of Grassy Point, N. Y. This is a kiln head guide constructed with a frame having a close panel in its lower part, and cross slats in the middle and upper parts. The upper part is provided with adjustable fastenings for connecting it with a side prop of the kiln. The guide is also provided with cords for giving a true taper to the sides of the center arch, so that the arch will have a uniform inclination upon both sides.

A novel balloon or aerial vessel, as the patent terms it, has been patented by Mr. Joel Ray, of Philadelphia, Pa. The invention consists of two inflated bags or balloons placed parallel to one another horizontally, and from which is suspended a car in which is carried a motor of any suitable construction, and using any kind of fuel best adapted to the purpose. Two propellers are located one above the other, and the machine is guided by two rudders located in the rear of the machine, and one in front. The car is provided with two large wings, one on each side, to assist in supporting the car after the desired elevation has been reached.

An improved banana crate, constructed in such a way that bunches of bananas may be handled and transported without danger of injuring the fruit, has been patented by Mr. William Davenport, of Philadelphia, Pa. The invention consists of a frame of suitable size to receive a bunch of bananas, lined with canvas or similar material. The frame is preferably made of two parts hinged together. The canvas is so attached to the frame that when the frame is opened the canvas will be spread out similar to the sacking bottom of a catbed, to receive the bananas, and when closed will suspend the bananas on the stretched canvas in the frame, so that the fruit will not be injured from contact with the wood.

An improved ladder adapted for fruit picking, tree trimming, or other outdoor purposes has been patented by Mr. Charles Bridges, of San Fernando, Cal. The ladder is mounted on a parallel bar which rests on blocks or legs which are slotted for the tenons on the crosspiece to rest in. When the ladder is used on a side hill, one side of the crossbar is raised at one side and supported at any degree of elevation desired by a pin extending through the slotted legs. This provides for any unevenness of the ground, and renders greater safety to the person using it. An ingeniously arranged seat or foot rest is provided for attaching to the ladder at any height desired. This rest is movable, and may be placed high or low on the ladder at the will of the operator, or dispensed with entirely.

An improved apparatus for the manufacture of fertilizers from offal and refuse, by means of which gases and vapors are brought into a liquid form ready for use as a fertilizer, has been patented by Mr. Joseph N. B. Bond, of New York city. The invention consists of a decomposing retort, which is located in the smoke chamber of a furnace, and is connected by a pipe with the drier on one side and with the condenser on the other. The gases and vapor generated in the drying chamber pass through the pipes into the retort and from thence into the chamber where they are condensed by admitting a supply of water. When the chamber has become full of condensed matter, it is drawn off through a pipe. This problem of how to dispose of offal in our large towns and cities is getting to be more serious year by year, and inventors can find no fitter province for investigation than this.

Mr. Nelson Seymour, of Erie, Pa., has recently received letters patent for an improved gold separator. A pan or other receptacle for holding a bath of quicksilver is provided with a series of pipes, so arranged as to admit a discharge of jets of water down upon the quicksilver and ore which lie at the bottom of the vessel. A feed trough and overflow outlet are both arranged above the ore to be separated, so that the waste matter is readily carried off, while the finest particles of gold will be held by the quicksilver at the bottom of the pan. A vibratory motion is imparted to the separator when in use. When the quantity of ground ore or sand fed into the pan rises to the level of a plate, the sand and other waste matter will, owing to the agitation produced by jets, gradually pass out at the discharge opening as it overflows the plate, and the gold, including the finest particles, will be collected in the quicksilver bath in the bottom of a pan.

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Steam Pumps. See adv. Smith, Vaile & Co., p. 172.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Ave., Phil. Pa.

Common Sense Dry Kiln. Adapted to drying of all material where kiln, etc., drying houses are used. See p. 174.

Contracts taken to manuf. small goods in sheet or cast brass, steel, or iron. Estimates given on receipt of model. H. C. Goodrich, 66 to 72 Ogden Place, Chicago.

Lightning Screw Plates, Labor-saving Tools, p. 156.

Woodwork'g Mach'y. Rollstone Mach. Co. Adv., p. 158.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

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James Hamblet, Electrical Clocks. P. O. Box 1414, N.Y.

Cope & Maxwell M'f'g Co.'s Pump adv., page 142.

Curtis Pressure Regulator and Steam Trap. See p. 140.

"Abbe" Bolt Forging Machines and "Palmer" Power Hammers a specialty. Forsaith & Co., Manchester, N.H.

The Sweetland Chuck. See illus. adv., p. 142.

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Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) D. P. asks if the Leclanché prism battery—one cell—would operate Prof. Hughes' induction balance. A. Yes.

(2) J. S. asks: Will a cannon ball fired vertically in the air return with the same force with which it left the cannon's mouth? A. The same force, less the friction of the atmosphere during its ascent and return.

(3) B. H. asks: How can I make a cast iron tank hold coal oil? It does not appear to leak through the pores of the iron, but creeps up the sides and over the edges as though they were lamp wicks. I want a composition that can be easily applied. A. Make your receiver airtight. Creeping cannot be avoided.

(4) J. S. P. asks: Does it require any more feed water to keep the steam pressure of a boiler at 60 pounds than at 40, after the pressure has been raised, provided the amount of steam used from boiler is governed by the governor on engine? A. If the work done by the engine is the same, the difference would be scarcely appreciable; it would be a trifle greater at 60 pounds, as the loss from leaks and radiation would be somewhat more.

(5) V. E. N. writes: I have noticed many times that while whittling the shavings would stick to my hands, knife blade, and clothes, the same as bits of iron would to a magnet. This was while sitting close to a stove. Will you please explain the cause of that through the SCIENTIFIC AMERICAN? A. The adherence of the shavings is due to electrical attraction, the electricity being generated by the friction of the knife on the dry wood.

(6) F. W. D. writes: In SUPPLEMENT, No. 252, are given instructions for making telescopes; the eye-piece is described as of medium power. Will you please give the foci required for a higher and a lower power, as there mentioned. A. For a lower power use a field lens of 2½ inch focus and eye-lens ¾ inch focus, 1⅛ inch apart; both plano-convex. For a higher power use a field lens of 1½ inch focus, eye-lens ⅝ inch focus, ¾ inch apart; plano-convex.

(7) J. L. asks for the method of making asbestos lime and magnesium carbons. A. Powder the materials very finely and then mix in any desired proportion with the carbon, however, in such a manner that the conductivity of the carbon is not impaired in any very great degree, for energy is lost in heating up these incombustible materials. For further information consult Dr. Moncel's work on the "Electric Light."

(8) E. I. G. writes: Will you inform me through your paper as to what uses ground or pulverized mica is put? A. Diamond dust, which is used to powder the hair, is ground mica. The luster of the costly French silver mouldings is due to ground mica. As a lubricator, it is very good, and mixed with oil it lasts longer than any other ingredient. The wonderful showers of diamonds in spectacular plays are mica scales. It is also used to dust signs, to make them glisten. See SCIENTIFIC AMERICAN, May 21, 1881.

(9) C. R. R. asks: 1. Could I use a common double-acting vertical steam pump for compressing air into a reservoir to run a 3 horse power rotary engine? A. No. 2. Will compressed air work as well as steam in a steam engine, the air in the reservoir being at usual pressure of steam in a boiler? A. No. 3. Would a steam gauge do for air reservoir? A. Yes. It would be much better for you to use your steam direct than to compress air for power. With steam you will get more than double the effect at the same cost.

(10) W. C. asks: 1. Is the "go-ahead" eccentric on a locomotive ahead of the crank pin or behind? In what position do both eccentrics stand on the crank shaft with the pin? A. Both the go-ahead and backing eccentrics are set ahead of the cranks, so as to be in advance of the crank, whatever way the engine is running. 2. What is the simplest way to tell which of the eccentrics has slipped, in case they do slip? Also the simplest way to set them. A. The eccentric and shaft should be marked in the correct position, then a slip can be detected by mere examination and the eccentric reset in its proper place by the marks.

(11) A. H. S. M. Co. ask: 1. What kind of wood can be used for a tank to hold material for sizing hats, which is a mixture of hot water and oil vitriol, of different degrees of strength? A. Sulphuric acid, unless very concentrated, can be retained in lead lined tanks without its attacking the lead. 2. Can you advise us how the pitch from yellow pine can be expelled from the wood? A. Possibly by heating the wood cautiously in a steam chamber or oven, the pitch can be expelled more or less.

[OFFICIAL.]

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FOR WHICH

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March 6, 1883,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 261 Broadway, corner of Warren Street, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications, not being printed, must be copied by hand.

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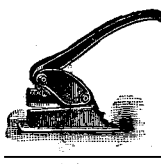

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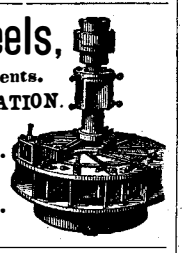

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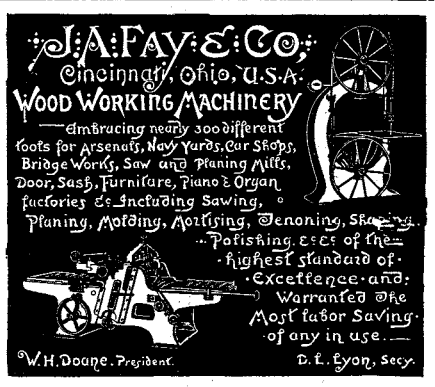

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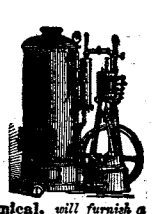

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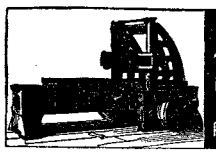

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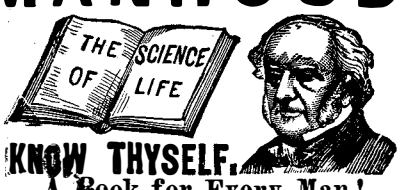

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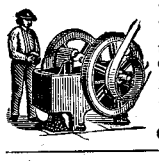

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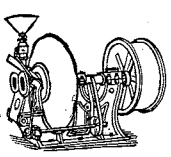

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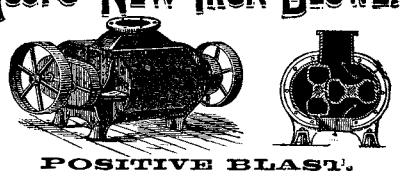

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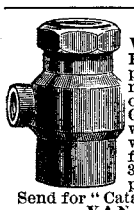

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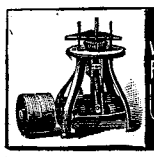

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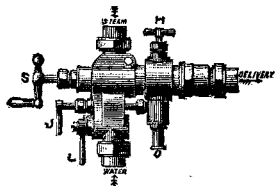
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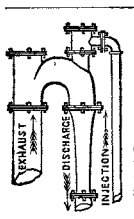

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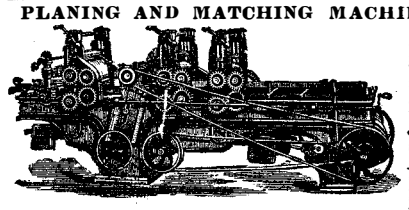
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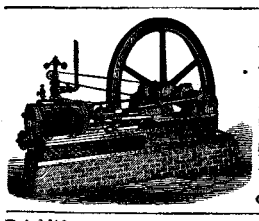
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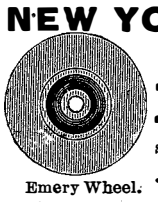
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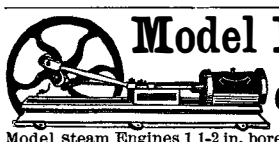
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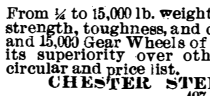
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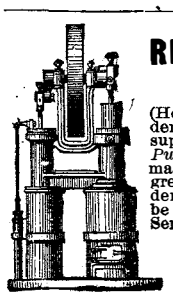
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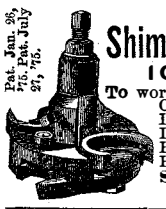
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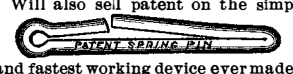

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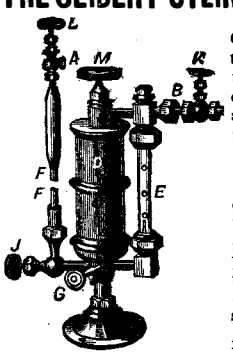

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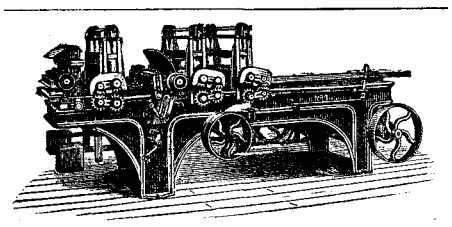
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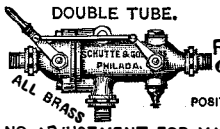

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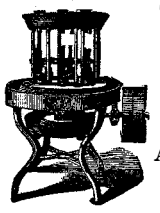
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